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TELECOMMUNICATIONS PRODUCTS
for World Markets

Canada

TELECOMMUNICATIONS PRODUCTS

for World Markets

COVER PHOTO:

At a glance . . . the major nationwide telecommunications facilities of the Telecom Canada member companies, shown here in the association's National Network Operations Centre in Ottawa, Canada.

External Affairs Canada
Affaires extérieures Canada

FOREWORD

Minister for International Trade
Ministre du Commerce extérieur
Canada

CANADA STANDS AS A PIONEER in telecommunications developments. The invention of the telephone, the first long-distance telephone call and the first nation-wide domestic satellite communication system have put Canadian ingenuity to the service of a large country and of other parts of the world. Canada has thus entered the "information age" with a state-of-the-art telecommunication network and an industry well-known for its innovative capabilities.

"Telecommunications Products for World Markets" presents an overview of Canada's achievements in telecommunications and profiles of some of its most active exporters of systems, equipment and services. The managers, engineers and other personnel of Post, Telegraph and Telephone authorities will no doubt find it particularly useful.

I am proud to associate the Department of External Affairs with the Canadian telecommunication exporters in this endeavour, and wish them and you, the reader, continuing success in your business relationships.

Jim Kelleher

James Kelleher

INTRODUCTION

Canadian Telecommunications Products

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CANADA IS A COUNTRY OF CONTRASTS with moderate to extremely cold climates, with two official languages and a multitude of cultures, and with large cities and small remote settlements spread over a vast territory which spans six time zones.

Expertise and equipment have been developed for a variety of uses in this large but sparsely populated country. Canadian companies offer the unique ability to work with their clients to solve specific telecommunications-related problems, in whatever area they may occur.

This directory will acquaint national telecommunications authorities with Canadian products and expertise, by first providing an overview of Canadian telecommunications. The overview is followed by profiles of some of the most active manufacturers and exporters of telecommunications equipment, and by sections listing the export capabilities of suppliers of turnkey systems, information systems, and consulting and training services. These exporters can supply those products and services from manufacturing plants and offices located in Canada.

Be it a radio subscriber system or a state-of-the-art modem, we trust that you will find what you need. For further assistance, just call the nearest Canadian trade office or contact us.

Technology Development Division
Department of External Affairs
125 Sussex Drive
Ottawa, Ontario
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CANADA: A WORLD LEADER IN TELECOMMUNICATIONS

Overview of Canadian Telecommunications

◄
This 14.2 m telemetry, tracking and control antenna is part of the ground control segment designed and built by SED Systems Inc. for the Brazilsat project. SED teamed up with prime contractor Spar Aerospace Ltd. on Brazilsat, Canada's eminently successful entry into the communication satellite systems export market.

COMMUNICATIONS HAS PLAYED a vital role in Canadian history. Canada is a vast country—the second largest in the world—stretching some 6,000 km (3,700 miles) from coast to coast and some 4,800 km (3,000 miles) from the United States border to the North Pole. Spanning seven time zones and covering 9,970 square km, Canada has a population of only 25 million living in communities often separated by great distances and geographical barriers. It is a country with two official languages, many different cultures and distinct regional identities.

Excellent communications networks have enabled Canadians not only to conquer distance, but also to express and benefit from the nation's rich diversity. From the invention of the telephone and the first long-distance telephone call, Canada has pioneered telecommunications developments and currently has three separate and complementary microwave routes spanning the country from east to west, as well as the world's first domestic satellite communications network with more than 100 earth stations. There are over 160,000 km (100,000 route miles) of microwave system connecting Canadian communities today. With more than 19 million telephones in service or 76 per 100 population, Canada rates fourth in the world in terms of telephones per 100 population.

In every part of the country, even remote Arctic settlements, Canadians enjoy sophisticated communications services. Telephone, business communications and broadcasting services are delivered by cable, microwave, fibre optics and satellite systems.

This highly sophisticated communications network is provided by a unique blend of monopoly and competition. Ten major telephone companies provide 94 percent of Canada's telephone service and together form the umbrella organization, Telecom Canada. Six of these companies are investor-owned, three are operated by provincial governments and the tenth, Telesat Canada, which provides domestic satellite services, is a co-operative ownership between the federal government and several telecommunications companies. A separate entity, CNCP Telecommunications, is a joint venture of the telecommunications divisions of the Canadian National and Canadian Pacific railways. CNCP provides a public message service, telex data, and a variety of voice and data special services over its completely separate microwave and satellite channels across Canada. CNCP competes with Telecom Canada in these modern business-oriented services and has connection privileges to the local network facilities of the other federally regulated carriers (Bell Canada and British Columbia Telephone Company).

There are about 140 other telephone companies throughout the country consisting of small rural, regional, and municipal systems, all of which interconnect with the major companies for long-distance services.

Communications services internationally are provided by the federal Crown corporation, Teleglobe Canada.

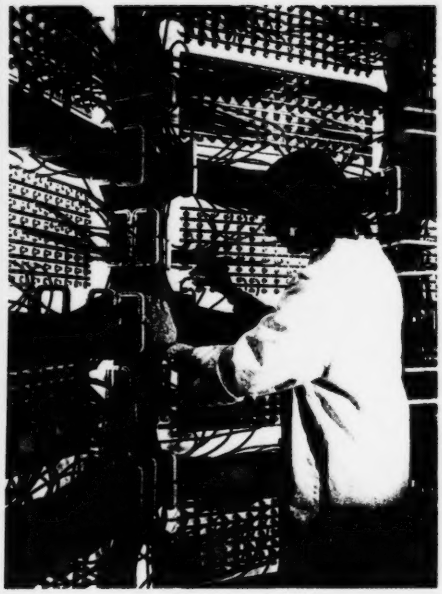
MANAGING THE NETWORK:

A look at Telecommunications Management in Canada

In Canada, two national telecommunications systems, Telecom Canada and CN/CP Telecommunications, account for 91 per cent of the $10 billion telecommunications markets. The larger one, Telecom Canada, now presents its views on how it manages nation-wide telecommunications.

THE INTERNATIONAL TELECOMMUNICATION UNION (ITU) is composed of independent public and private telecommunications organizations. In Canada, the structure of the telecommunications system is similar. Rather than obtaining service from a single national entity, Canadians across the country rely on independent, regional telecommunications carriers. However, ten of these carriers have cooperated for over 50 years to provide a nationwide network that today offers a range of voice, data and image services.

These carriers are the member companies of Telecom Canada, a nationwide association that operates through voluntary participation, a committee structure and decision-making based on unanimity. In essence, Canadian telephone companies work individually in planning and operating the local and intra-provincial parts of the network, and co-operatively for the long distance network.



BELL-NORTHERN RESEARCH (BNR) is Canada's largest private industrial research and development organization. At the company's headquarters in Ottawa, individual computer terminals are linked to the mainframe computer by means of the coaxial cable patch panel pictured here. TELEGLOBE CANADA provides BNR with dedicated data circuits to England for file transfer, corporate correspondence and marketing support.

This co-operative approach can be traced back to the original trans-Canada open-wire carrier system, installed in the early 1930's to route national traffic through Canada instead of the United States. Today the same companies are working on a 7,000 km optical fibre transmission system from coast to coast.

This way of doing business nationally has not inhibited the members from innovating or evolving in the way they provide service. In fact, the progress in Canadian telecommunications could not have occurred without their commitment to co-operation in pursuit of a common goal.

As a result of this co-operation, today's Telecom Canada network is a $24 billion resource, growing at over $2 billion annually and serving 15 million telephones.

Management of this resource requires a full range of activities from the fundamental plans which decide the shape of the network for the next 20 years, to minute-by-minute decisions in response to network crises. The planning process starts with Telecom Canada's fundamental (or long range) planners.

FUNDAMENTAL PLANNING

Working three to 20 years in advance of requirements, the fundamental planners are responsible for the application of new technology; for planning new routes and additions to existing routes; for the location of intelligent nodes within the network; and for locating special equipment for network services other than voice. Their job is to work with the member companies to ensure that the whole long distance network is planned as a single entity. Every decision is backed by economic studies of the possible alternatives.

Current major projects include the deployment of common channel signalling; the timing of the next new route across Canada, especially in terms of competing technologies; and deciding the location of databases for credit card verification and for 1-800, "inward calling" service. Also underway are a range of projects associated with the overall evolution to the Integrated Services Digital Network (ISDN).

TECHNICAL PLANNING & STANDARDS

All of this planning work must take into account a whole series of standards that ensure national and international integration, and the best possible network performance. At present, standards work at Telecom Canada is concentrated mainly on digital technology.

Equipment standards are written to ensure that purchases from different manufacturers are compatible and achieve similar performance. Other standards cover areas such as placement for optical fibre cables.

In addition, Telecom Canada representatives are involved in several international standards bodies, such as the ITU, the American National Standards Institute and the International Standards Organization. Here Telecom Canada delegates make proposals based on Canadian consensus, and ensure the Telecom Canada network is integrated with similar networks around the world.

As a complement to the standards activity, technical planning covers diverse items such as specifications of the common channel signalling system, and an audio bridge for conference service, among others.

The heart of the network . . . A technician at TELECOM CANADA's National Network Operations Centre (NNOC), discusses a potential problem with a colleague in another part of the country.

CURRENT PLANNING

After fundamental plans are set and standards work is well underway, Telecom Canada's Current Planning group begins to implement the fundamental plans. This involves co-ordinating the activities of the member companies so that all facilities are ready on the required date, which may change from the original plan based on the availability of more accurate forecasts as the service date approaches.

This group also prepares forecasts—a critical task as inaccuracies could lead to premature capital expenditure or insufficient circuits to meet demand. Forecasting is complemented by Rates Planning, which attempts to optimize revenues by keeping the network utilization high at all times through reduced rates during off-peak hours.

ENGINEERING & INSTALLATION

When it comes to the actual engineering and installation of facilities, each Telecom Canada member company coordinates this function through their own management systems. In other words, each member company constructs its own facilities to be used for the nationwide network.

OPERATIONAL SUPPORT SYSTEMS

Of course, planning and building these network facilities is never enough. Like all man-made systems, a telecommunications network will break down if it isn't maintained. And it will never run at peak efficiency without constant management and the use of mechanized systems.

At Telecom Canada, a number of operational support systems come into play to help ensure peak operation and maintenance. These systems determine automatically the status of the major network elements. Some of the systems cover the network in general, and some cover specific sections or services.

For example, the leased facilities monitoring system (LFMS) provides information on major leases such as the bandwith leased to Teleglobe Canada, the nation's overseas carrier, for international transit traffic.

Another system called TRIMMS (TransCanada Remote Interface Monitoring and Management System) provides real time information on major transmission facilities. This system is hierarchial, providing necessary information to the maintenance manager for action, to the provincial status centre, and to the National Network Operations Centre (NNOC) in Ottawa.

The NNOC is the heart of Telecom Canada's network management systems. Here managers work at computer terminals in front of two huge display boards. The current status of all major circuits is reflected on the boards, with more detailed information available through the terminals.

The provision of such information, at points across the country, often allows potential trouble spots to receive attention before the network is seriously affected.

OPERATIONS PLANNING

An integral part of planning new support systems is ensuring that they can be properly maintained. Operations planners are responsible for this activity and work with system developers to ensure that test methods and procedures are in place, and that operations personnel have been trained when equipment is readied for service.

A severe test of the support systems in the national network can occur when an unexpected condition interrupts service. This may be a natural phenomenon such as a flood or landslide, a man-made hazard such as a fire or someone accidently digging through a major cable, or an event, such as a snow storm, which triggers an excessive number of calls either in one location or across the network.

Experience has shown that interdependence of network elements can cause additional problems far greater than the original one if rapid and effective action is not taken. The converse is that effective action can minimize the problems.

The job of the traffic network managers is to apply controls on the network to allow it to perform at its maximum capability in any adverse condition. From the NNOC they have the ability to modify routing in switching machines to avoid trouble spots.

They can block calls which for some reason cannot complete so those calls are not tying up network resources which could be available for other traffic. These managers rely on automated systems for their information and for sending their control messages, as well as for some pre-processing of the input information. But much of the decision making depends on their training and skills.

In the end, it is this investment in training and skills—in all areas of network management—that contributes the most to the smooth operation of Telecom Canada's $24 billion network. Without this investment, there would be no network, and no service.

DATA COMMUNICATIONS

IN RESPONSE TO THE NEED for high-speed and dependable data and computer communications, the TransCanada Telephone System (now Telecom Canada) introduced Dataroute in early 1973—the world's first public digital data network on a countrywide customer-to-customer basis. This was closely followed by CNCP's nationwide and competing Infodat network. By 1977 the Datapac network of TransCanada Telephone System and the Infoswitch network of CNCP were established across the country to provide fully switchable digital data networks using the new packet switching techniques. Telecom Canada led the way in developing an internationally recognized packet switching standard called X.25, which has been ratified by the International Telegraph and Telephone Consultative Committee (CCITT). Both Infoswitch and Datapac can be extended to other countries through Teleglobe Canada's Globedat, an international data gateway, which routes both packet and circuit switched traffic and provide low-to-medium speed data transmission.

As the market develops, more and more service offerings are appearing to suit the needs of special interest users. Electronic mail is handled through Telepost, a joint CNCP and Canada Post Corporation service that combines electronic messaging with the established postal network. Both Telecom Canada and CNCP have services that allow word processors made by different manufacturers to communicate with each other. Infotex is the main CNCP service while Telecom Canada offers a similar service under the generic name teletex. For access to databases Telecom Canada has a service called iNET 2000 that acts as a guide and gateway to a wide range of computer-based information services.

Terminals are changing rapidly as demand grows for the integration of office functions and as the industry moves towards an integrated services digital network (ISDN). ISDN is the industry specification for an all-digital, end-to-end telecommunications network. Bell Canada plans to trial market ISDN among customers beginning in mid-1987 to assess impact on its network, services and customers.

Some of the firms described in this brochure offer ISDN-related equipment and services and a few describe their local area networking (LAN) capability. However, the reader can find more information in the nearest Canadian Embassy, High Commission or trade office by asking for other brochures such as "Computing Products for World Markets".

DIGITAL EVOLUTION

THE POTENTIAL FOR enhanced speed and reliability of digital transmission coupled with reduced costs has resulted in a major thrust by Canada's communications planners to create an all-digital communications network across Canada. The evolution started as early as 1965 with the introduction of digital transmission systems in the metropolitan inter-office networks. In the early 1970s digital radio made its appearance on the long-haul network. Now Telecom Canada has an advanced digital radio system operating across the country.

Issues which many telecommunications administrations around the world are facing as they approach the digital transition were faced by Bell Canada several years ago when that company embarked on the transitional course. In 1975, the company undertook a study on the advisability of introducing digital switching into its network. Following the study, the company decided that all new local and long distance switching would be digital. Its first digital switch went into service in January 1979. Experience since then has proved that the forecast of 30 percent savings was indeed conservative in that building space requirements alone have improved 32 percent through subsequent improvements in technology.

In setting its course toward a completely digital network, the company recognized that the conversion process needed to be managed and co-ordinated to minimize costs and avoid service disruptions. It proceeded to restudy the fundamental network architecture, and launched a program to change operational and managerial methods and develop training programs to update and upgrade the work force.

Digital Microwave . . . One of the towers in TELECOM CANADA's dual transcontinental chain of microwave radio routes. A substantial portion of this network operates using digital transmission techniques.

Digital systems have met or exceeded initial expectations in terms of flexibility, economy, performance, capacity, and above all, in service to users. The expertise that Bell Canada has developed has been made available to countries around the world by Bell Canada International (BCI), the consulting and management services company which has assisted in digital projects in 23 countries.

The reader will also find in the consulting section of this brochure a description of other firms which can share digitalization expertise gained by their parent operating organizations, such as TSI of the British Columbia Telephone family of enterprises.

Digital switching has vaulted Canada into the digital world. Northern Telecom Limited (NTL) became the first company in the world to announce and bring forth a complete family of fully digital switching and transmission systems. Their DMS family of central office switching systems and their Meridian SL family of integrated services networks enable organizations to develop their information systems over time without having to discard existing equipment or without being locked into a single supplier. This translates into their concept, OPEN World (open protocol enhanced networks). Northern Telecom has in service or on order more lines of fully digital systems than any other manufacturer in the world (26 million lines at the end of 1985).

Other Canadian manufacturers also offer state-of-the-art digital PBXs, business communications systems and packet switching systems. Digital switching capability is gradually being extended into rural areas through the employment of remote line modules homing onto a parent switch perhaps 80 km (50 miles) away. SR Telecom specializes in point-to-multipoint digital radio systems in the 1.5, 1.8 and 2.4 GHz Bands which are now also in service in some 30 other countries.

There seems no doubt that the Canadian objective of an all-digital network adapted to the concept of the ISDN will be a reality by the 1990s.

FIBRE OPTICS

FIBRE OPTIC SYSTEMS are well recognized for high-capacity transmission with increasing applications throughout the world. Canadian field trials started in 1976 and include applications as an urban fibre loop facility in a residential area (Toronto); an integrated services customer loop system in a rural environment linking some 150 rural homes with telephone, television, radio and data communications (Elie, Manitoba); and a high-capacity entrance link some 50 km in length between Calgary and a connecting point on the backbone digital radio route. In Saskatchewan all cities and some 40 major towns are now linked by fibre optic structures, an extensive 3,200 km "lightwave highway", that carries traditional long distance messages and extends computer and cable TV services to many communities throughout the province. Ultimately, the network has paved the way for a vast array of new convenience services including security alarms, remote metering, ambulance alerting—the list is virtually endless.

Bell Canada is using fibre optic cable in all future inter-office trunk systems. This heralds a new fibre era not unlike the introduction of digital transmission (T-1 carrier) in the late 1960s but with a vastly increased transmission capability for a multitude of potential new services.

Telecom Canada started implementation in 1986 of a new national telecommunications network based on optoelectronics technology to be completed by 1991. An enhancement to the existing digital facilities, the fibre optic network will extend the supply of this high-performance, high-capacity transmission medium for integrated voice, data and image communications well into the next century. The bandwidth of fibre optics and its cost-effectiveness as a transmission link between and among central office switches and transmission systems, make it a key element in evolving the concept of ISDN.

The most prominent company in the Canadian fibre optics field is Northern Telecom. The company has the major Canadian capability of supplying fibre optics cable plus electronic and optical hardware—completely integrated systems. Canstar Communications and Phillips Cables Ltd. are among other Canadian companies providing fibre optics systems.

SPACE COMMUNICATIONS

CANADA ALWAYS HAS HAD a keen and active interest in space. As the third nation to design and built a satellite, following the Soviet Union and the United States, Canada launched its first spacecraft, Alouette 1, from a United States test range in September 1962.

In the intervening years, this Canadian expertise has been maintained with a series of more sophisticated satellites and new services. In November 1972, with the successful launch of *ANIK-A*, Canada became

SPAR AEROSPACE: Custom stitching of insulation material for European satellite Olympus.

TELESAT owns and operates one of the most respected domestic satellite systems in the world.

the first country in the world to have a nation-wide domestic telecommunications system using satellites in the geostationary satellite orbit. This capability has resulted in telecommunications consulting contracts and the production of complete satellites. Canada (Spar Aerospace) provided a communications satellite for Brazil. Canada has also co-operated extensively with developing countries including the People's Republic of China where some 26 earth stations, related technology, and a central control station for their domestic system are under construction. The company is also providing training for their space communication programs.

The testing of systems like the Canadarm for the U.S. space shuttle or of very large satellites, such as the European Space Agency's Olympus, is another highly specialized capability. Canada's David Florida Laboratory is one of the few facilities in the world that can perform simulated launch and space environment tests on large satellites and subsystems and components for spacecraft. The laboratory is located in the Communications Research Centre of the federal government, and its facilities are available to industry and government agencies on a cost-recovery basis.

Telesat Canada, the world's first domestic communications satellite company, transmits and distributes all forms of telecommunications by satellite in Canada. It is a combined venture of the federal government and several telecommunications companies. Experimental transponders on the Telesat *ANIK-B* system have permitted a wide range of investigations into services such as direct broadcasting, voice and data message services to small earth stations, teleconferencing, distance education and telehealth.

Microtel Ltd. produces a "Spacetel" system ideally suited to provide both voice and television signals to remote locations. Spacetel consists of distantly located terminals that provide communication links to one another via leased satellite circuits. The main terminal is the master control station which performs the common control functions of the system and interfaces with public or private networks. The remote terminals may be single or multiple channel types thus providing users great flexibility to meet any size of system they require.

Satellites currently provide Canadians with many important daily services, but one of the most dramatic and exciting roles has been to rescue accident victims using the SARSAT system. This specialized satellite system was developed by Canada, the United States and France to improve marine and aviation search and rescue operations. It works in co-operation with the Soviet system COSPAS. COSPAS/SARSAT has already played a major role in many rescues.

The future holds promise of even more exciting new space systems. Canada is committed to the development of MSAT, a mobile satellite service, to provide effective communications to mobile radio users outside the major metropolitan areas or in remote locations.

INTERNATIONAL ACTIVITIES

CANADA HAS CONSISTENTLY demonstrated its confidence in international co-operation and the extension of international networks. It is an active member of the committees of the International Telecommunication Union (ITU) which it joined early in the century. In a combined government-industry effort Canada holds a significant continuing administrative and technical presence in this international forum. A continuing commitment of delegates to leadership roles in the administrative counsel and technical areas such as data, digital switching and signalling, telematics, integrated services digital networks (ISDN), operations and maintenance, microwave radio, satellites and the new broadcasting satellites is fully supported by current technical contributions. Canada lent its assistance to the work program of the International Commission for world-wide telecommunications development and is actively helping the ITU and the international telecommunication authorities to implement its recommendations. It supports the Centre for Telecommunications Development established in Geneva. Canada also plays an active role and is an important contributor to the World Bank, the African, Asian and Inter-American Development Banks, the Commonwealth Telecommunications Organization, the Pacific Telecommunication Council, the Inter-American Telecommunications

Conference, the Agence de Coopération Culturelle et Technique, and a number of other regional organizations.

The Canadian International Development Agency shares with the ITU the same priority of human resources development. Canada has renewed its commitments to ITU's training sharing system and supports ITU's objective of bringing mankind within easy reach of a telephone by the early 2000s. Canada has been and stays a pioneer in developing appropriate technology for remote and rural areas.

Teleglobe Canada, a federal Crown corporation, provides submarine cable and satellite links with the international community. Teleglobe is an active partner with the Canadian Telecommunications Carriers in connecting them to international users, extending their new services internationally as well as providing specialized services such as Globefax, a high speed digital facsimile service and Intelpost, an electronic mail service offered in collaboration with Canada Post. Another world's first is the recent introduction of Confratel, an intercontinental digital teleconference service linking Canada and Britain with full-motion, two-way colour and voice communication. Teleglobe Canada has also developed a Network Inventory System now being offered to other international carriers.

BELL CANADA INTERNATIONAL:
Analyzing a customer's problem.

CONSULTING & TRAINING SERVICES

CANADIAN TELECOMMUNICATIONS ENGINEERS and technicians travel the world as consultants in the design, procurement and operation of all types of telecommunications equipment. Among the Canadian companies prominent in space-related consulting services are Microtel Limited, Canadian Astronautics Limited, Com Dev Ltd., Miller Communications Systems Ltd., SED Systems Inc., Spar Aerospace, and Telesat Canada. In the broader area of general telecommunications services many of the operating companies have specialist consulting groups which are described in the consulting section of this brochure. Others have also developed a reputation of excellence around the world.

Canadians performing services, whether planning, engineering, supervising or training, consistently offer high quality and value. They also have the expertise to adapt systems to clients' particular needs.

Bell Canada International Inc. has provided a major operations and management consulting service to the Kingdom of Saudi Arabia for more than five years. This contract also emphasizes the human resources required in the telecommunications environment.

The special skills in management of people and training requirements are, perhaps, even more important than technology excellence in creating an efficient world-class telecommunications operation.

Microtel Learning Services is another private organization that started by organizing and delivering courses to technicians and managers in Western Canada and has now grown into a major provider of computer-based training to major telecommunication authorities, firms and other organizations in Canada, in the United States and many other countries. Canadian firms participated in the Development of the ITU and helped develop training standards. Canada remains committed to increasing transfer of knowledge to improve the productivity of personnel and the overall efficiency of telecommunication equipment and networks.

PLANNING A NATIONAL 7000 KM FIBRE OPTIC NETWORK

IN 1984, MANAGERS IN TELECOM CANADA conducted studies that led to a decision to install a digital fibre optic transmission system in the coast-to-coast network. This digital system will be incorporated into Telecom Canada's existing all-digital network, which already stretches across the country.

The first sections of the fibre route will be installed in early 1988 and the final link in 1991. The technology selected is the high-capacity 565 M bps fibre, which provides capacity for 8032 voice or equivalent channels for each fibre pair.

Confidence in fibre optic technology has been building over a period of several years. Systems of lower-capacity, 24 voice channels, are in wide use in many cities for inter-office trunks.

Fibre Optics . . . once a technology for the future, will soon form the backbone of a nationwide digital telecommunications network.

Some long-distance circuits have also been installed using 135 M bps technology, including cross-border connections to the United States. Experimental systems for building "wiring" and analogue transmission of television signals have all added to the experience.

The need for additional circuits in many major cross-sections of the national network coincided with the availability of 565 M bps systems from several manufacturers. This was the combination of circumstances which made possible the decision to use fibre optics.

PLACING AND ROUTE SELECTION

While the use of aerial cable has not been ruled out, the great majority of the fibre optic route will be buried or placed in underground ducts. As for location, this is a critical decision that must be approached on a kilometer-by-kilometer basis.

The main alternatives have been ranked in order of preference, based mainly on ensuring a secure route. The first choice is along limited access highways; the second, 100 m from a highway; and so on.

Conflicting with the need for security is the need for access, particularly in an emergency situation if the cable needs repairs. For this reason some of the more remote choices have been ruled out.

PROTECTION

The fibre optics section of the national network will have a two-level system for ensuring backup in case of interruptions, using devices called "protection channels".

Both levels of protection provide appropriate alarms to initiate maintenance action. Both also have levels of priority, so that a channel which has switched to protection can be forced back to its regular route if another channel fails completely.

RESTORATION

Despite these backup systems, and the precautions in locating and placing the cable, it must be expected that a system of 7000 km will experience more than one cut per year due to highway or other construction work. It must also be expected, based on experience with coaxial and other cable systems, that an outage will last several hours. This pattern is very different from microwave systems which rarely have a complete route failure.

To ensure continuity of service, arrangements are made to have circuits on failed fibre routes restored on other facilities, such as digital microwave radio. In most parts of the country, protection channels are available on these microwave systems.

Once the microwave capacity is exhausted, the only practical way of restoring will be on a second fibre route. These restoration needs will be the main trigger for building Telecom Canada's second coast-to-coast link.

For the members of Telecom Canada, fibre optic transmission will quickly become the main bearer system for the coast-to-coast network. Fibre optics links will provide high quality, high-capacity circuits, and with the inherent flexibility of digital technology, will be capable of meeting Canada's communications needs for many years.

FUTURE TRENDS

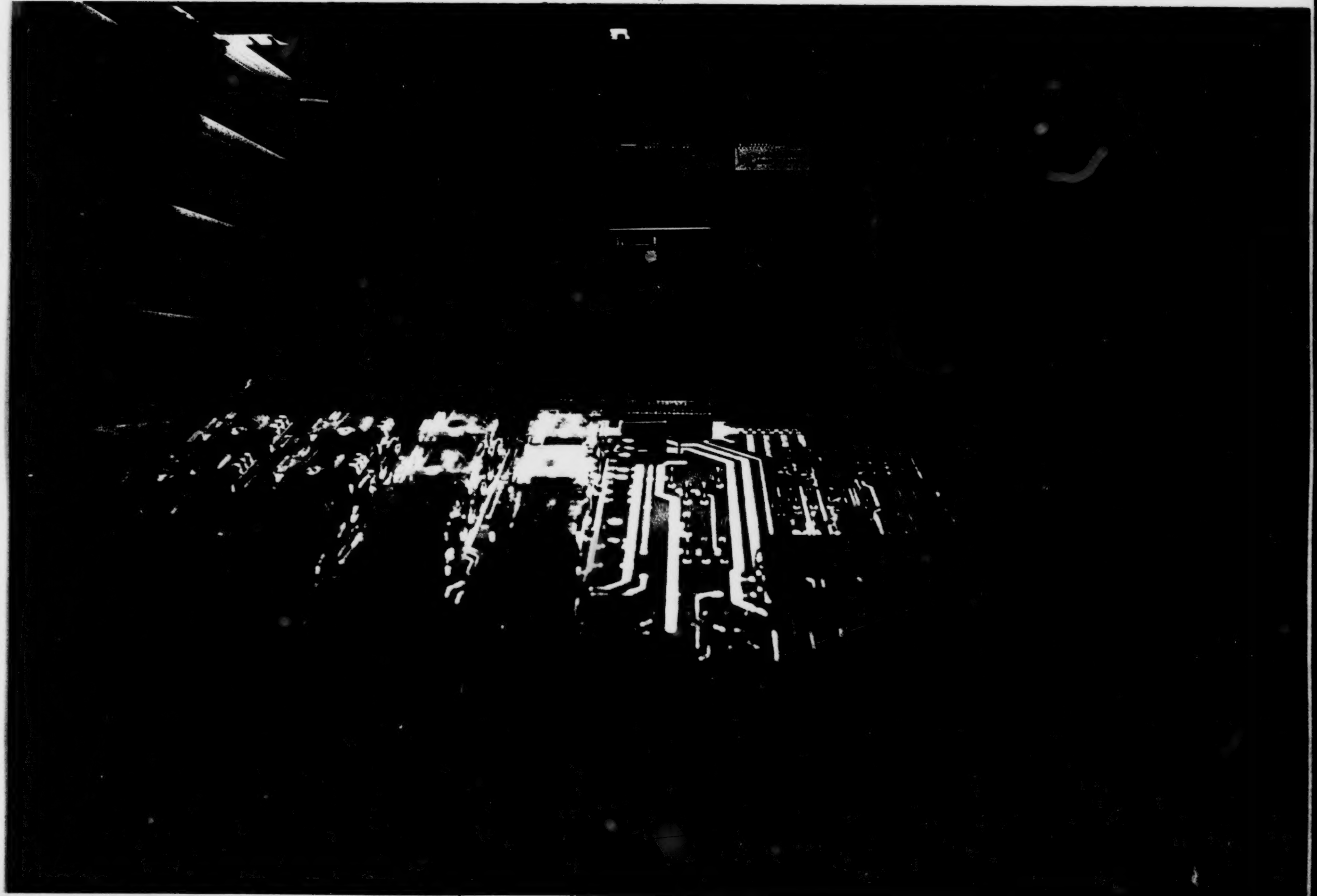
TODAY, COMMUNICATIONS TECHNOLOGY is more important than ever. We have entered the so-called "information age," an era in which information itself is becoming a dominant commodity and the capacity to generate, process, store and transmit information is becoming critical to economic strength.

Communications is one of the fastest growing sectors of the world economy and it is undergoing revolutionary transformations. Increasingly, the boundaries between telecommunications, computers and other technologies are dissolving, thus creating whole new industries, sophisticated new services and products, together with dramatic changes to our working and home environments.

Canada's early involvement in telecommunications and its continuing communications needs have placed it in the forefront of the new information era. It has contributed to advances in many areas including data networks, digital switching and transmission, satellite communications, fibre optics, videotex, direct broadcasting satellites and the creation of related international telecommunications standards. Canada's well being is very dependent on international trade. Exporting its products, expertise and services is vital. In the telecommunications field, Canada has earned an enviable reputation in a number of areas and Canadians are committed to living up to this challenge by serving well and building sound long-term relationships with their clients.

TELECOMMUNICATIONS: SOME WORLD LEADING CANADIAN ACHIEVEMENTS

1874	Alexander Graham Bell invented the telephone in Brantford, Ontario, Canada.
1876	First long distance call was made between two towns, 16 km apart, in Ontario, Canada.
1901	First radio signal spanning Atlantic Ocean—from Cornwall, England to Signal Hill, Newfoundland, Canada.
1962	Canada becomes the third country in the world with its own satellite—Alouette 1.
1971	First digital microwave transmission system.
1972	First geostationary domestic satellite communications system—ANIK A1.
1976	First family of digital central office switching equipment.
1976	First satellite to test the super high frequency, 14/12 GHz bands—HERMES.
1976	First demonstration of Direct Broadcasting by Satellite (DBS) to earth stations small enough to be situated on or near individual homes.
1977	First packet-switched network.
1978	First dual band commercial communications satellite (6/4 GHz and 14/12 GHz—ANIK B).
1981	First remote manipulator system for space, "CANADARM" for launching payloads such as communications satellites, tested aboard second flight of space shuttle Columbia.
1982	First and longest all-digital nation-wide telecommunications network.
1985	First national cellular mobile radio telephone service installed in 23 metropolitan areas across Canada.
1986	Longest fibre optic domestic integrated network, 7,000 km spanning the country—construction contracted; completion projected for 1991.



INTRODUCTION

Manufacturers' Section

THIS SECTION PRESENTS a list of selected Canadian manufacturers with proven export capabilities.

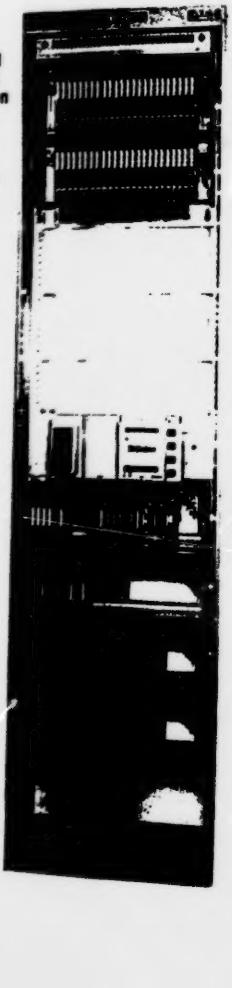
The profiles have been approved by the firms but do not necessarily list all of their products available for export. The products listed reflect an attempt to highlight those of particular interest to national telecommunication authorities.

A product cross-listing index is located at the end of this section.

◀
NORTHERN TELECOM LTD. DMS 100 Digital Switch.

▲
The 'JOHNNY CANUCK' block-down conversion receiver package is designed by 2001 S.N.I., specialists in the design of C and Ku band satellite communication systems.

▶
A.E.I. TELECOMMUNICATIONS (Canada) Ltd.'s ANIPAK offers reliable, low-cost automatic number identification.



2001 S.N.I. (SATELLITE NETWORK INC.)

202-1107 Homer Street, Vancouver, BC V6B 2Y1, Canada
Telephone: (604) 669-2001, Telex: 04-508406

2001 S.N.I. designs and markets C and Ku band satellite communication systems and decoders, including receivers, LNAs, satellite dishes, program trackers and acctuator arms. In addition to its own products, the company will private-label systems for other firms, making available its own designs. 2001's satellite products are backed by marketing and distribution consulting services. The company also offers video teleconferencing on an international basis.

2001 began operations six years ago, and went public in 1985. This year it plans to step-up export activities in both satellite equipment supply and video teleconferencing, initially with European countries. The company currently exports to the US and Mexico.

A.E.I. TELECOMMUNICATIONS (CANADA) LTD.

419 Notre Dame Avenue, Winnipeg, MB R3B 1R3, Canada
Telephone: (204) 942-7221, Telex: 07-57588, Twx: 610-641-9534, Cable: ASSOCELECT

A.E.I. Telecommunications manufactures telephone products and systems. Its principal export product is ANIPAK, an automatic telephone number identification system which generates and forwards to a billing centre the identity of the calling telephone number during long distance calls. ANIPAK can be added to electromechanical exchanges such as step-by-step, crossbar and semi-electronic. Over 800 systems have been installed in Canada, the US, Jordan, Columbia and Pakistan, and A.E.I. is currently working on a major contract in Guyana. The company also manufactures TELEPAK/ERS, an emergency, microprocessor-controlled system; TAS cord-type telephone answering switchboards; and EPC, an electronic programmable controller.

Established in Canada for 55 years, A.E.I. counts all the major Canadian telephone companies among its customers. The company is a subsidiary of General Electric Company of England.

ABROYD COMMUNICATIONS LIMITED

614 Colby Drive, Waterloo, ON N2V 1A2, Canada
Telephone: (519) 746-1743

Abroyd Communications serves the telecommunications and broadcasting industries by offering the following products and services: design, engineer, supply and installation of towers for AM, FM, TV, CATV, HF and LF applications; design, supply and installation of towers for microwave telecommunications; design, plan and construct or supervise the civil works associated with the above; supply and/or installation of antennas and transmission lines; tower maintenance and inspection services; special engineering services for tower modification or analysis of existing structures; antenna system orientation; tower accessories; and project management.

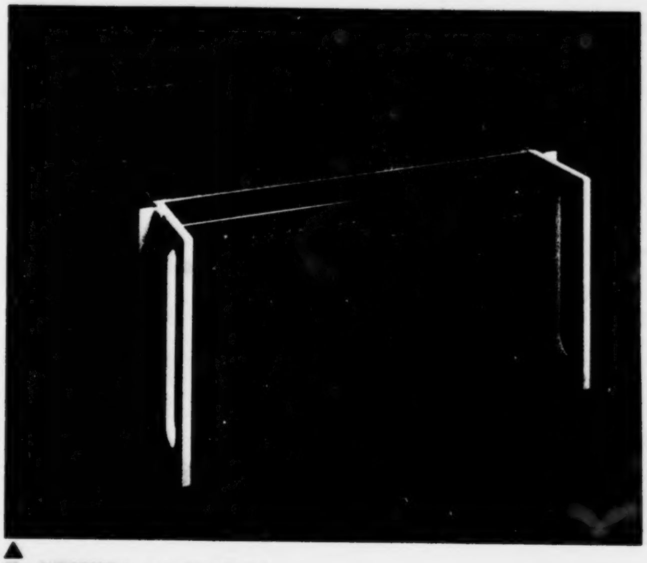
The company was incorporated in 1984 when a group of employees purchased the assets of Abroyd Construction from its parent company. Major projects have been completed for Dominican Telephone, the Tunisia PTT, the Congo Ministry of Communications and the US Department of Reclamation.

AEA ELECTRONIC LTD.

P.O. Box 850, 142 Perth Street, Richmond, ON K0A 2Z0, Canada
Telephone: (613) 838-2554, Telex: 053-3878

AEA is a privately-owned 100% Canadian company specializing in the manufacture of automatic test systems, telephone channel simulators, wire line simulators and ISDN test instruments and systems. These products are used to test data modems, wireline and ISDN data transmission equipment, and are addressed to both the end-user and modem OEM markets. The company also provides consulting and testing services for data modems.

Since its inception in 1974, AEA has been growing steadily both in terms of its hardware products and personnel. Most of the company's exports are to the US, with substantial overseas sales to numerous countries throughout the world.



▲
The AUTOTEST 2, an automatic test system for testing data modems, is one of a range of test instruments and systems manufactured by AEA ELECTRONIC LTD.

AEG BAYLY INC.

167 Hunt Street, Ajax, ON L1S 1P6, Canada
Telephone: (416) 683-8200, Telex: 06981293

AEG Bayly Inc. specializes in the research, development and manufacture of analog and digital telecommunications equipment, which includes a standard line of transmission and control products and custom-made equipment and systems. The product line includes voice/data multiplexers—drop and insert, T1 or CCITT standard program channels, digital/analog, stereo; party line signalling equipment; control systems for radio and telephone communications; open wire carrier; telecommunications filters and wire-wound components; line conditioning products; and FM broadcast transmitters and associated products.

In business for over forty years, Bayly began by producing customized electronic equipment and providing instrumentation and calibration services. In the 1960s, the company started to design and manufacture specialized analog communications systems for railways, utilities and telephone companies. Since 1970, Bayly has operated as a wholly-owned subsidiary of the AEG-Telefunken Group of West Germany.

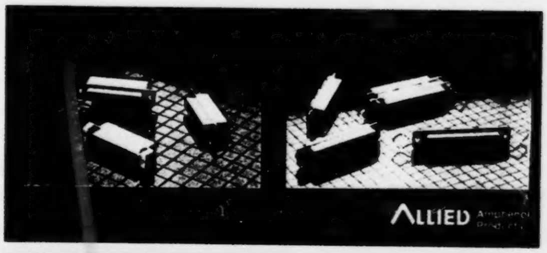
Bayly has recently supplied equipment and systems to customers in the US, Europe, and several other countries, including Argentina, Mexico, Venezuela, Israel, Singapore, New Zealand, Kenya and Iraq.

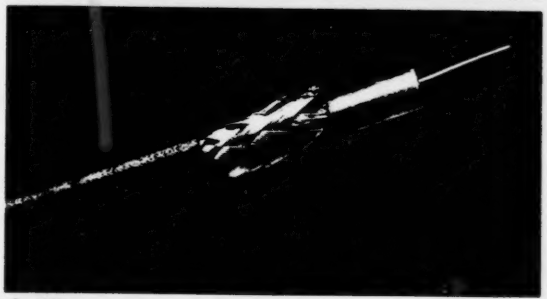
ALLIED AMPHENOL PRODUCTS

44 Metropolitan Road, Scarborough, ON M1R 2T9, Canada
Telephone: (416) 291-4401, Telex: 065-25210

Allied Amphenol Products designs and manufactures EMI, RFI filter connectors for applications in telecommunications, the computer industry and the military. The company also provides related consulting services.

The company is an operating unit of the US-based Amphenol group of companies (wholly-owned by Allied Signal Corp.), which operates manufacturing facilities in Canada, Great Britain, West Germany, France and Italy, in addition to its US plants. The company was established in Canada in 1954, and has exported its connectors to the US, Great Britain, Germany, France, Israel and Japan.





▲ TOP:
ALLIED AMPHENOL's 'D'subminiature EMI filtered plugs, receptacles and adapters are designed for the telecommunication industry.

▲ BOTTOM:
RG-58/u-one example of ALLIED AMPHENOL products line of high quality MIL-C-17 style & other broadband R.F. coaxial cables.

AMDAHL COMMUNICATIONS INC.

2330 Millrace Court, Mississauga, ON L5N 1W2, Canada
Telephone: (416) 821-9900, Twx: 610-492-8860

Amdahl Communications Inc. designs and manufactures digital communications equipment, including multiplexing products that operate at trunk speeds from 56 kbps to 2.048 Mbps over such media as 4-wire line, terrestrial microwave links, or satellite circuits. Channel rates range from 110 bps to 768 kbps. Other products include X.25 switches and protocol converters, limited-distance data sets, network synchronization equipment and digital repeater units, all of which may be integrated into networks under single network management capability. Amdahl has broad experience in large networks and is a supplier to Canada's Dataroute, the longest digital communications network in the world.

The company exports to the US, where it has several major contracts for networking products with end users in the resource and banking communities, and to European and Far East markets.

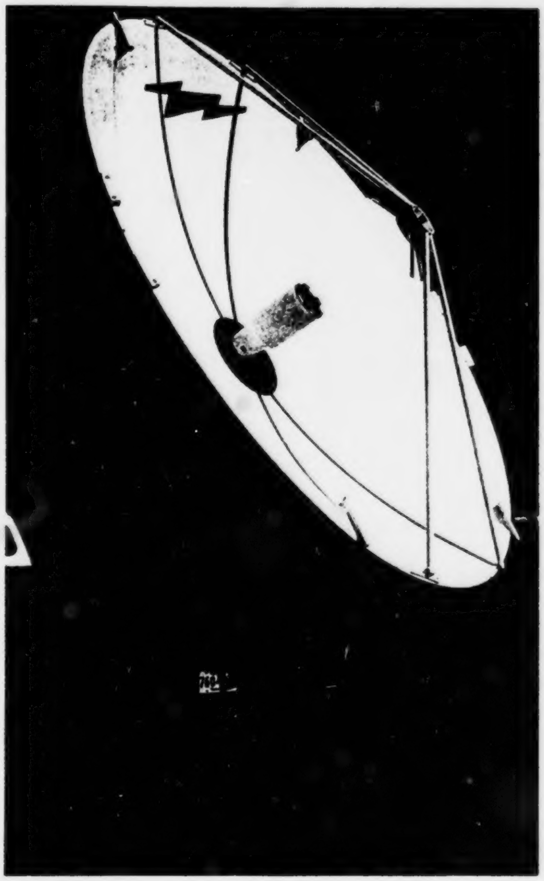
Amdahl Communications Inc. is an operating business unit and product centre of US-based Amdahl Corp., with a world mandate for products designed and manufactured in Canada. Formerly called Tran Communications Ltd., the name was changed to reflect the 1980 purchase of Tran Corp. by its parent. The company has been operating in Canada since 1973.

ANDREW ANTENNA COMPANY LIMITED

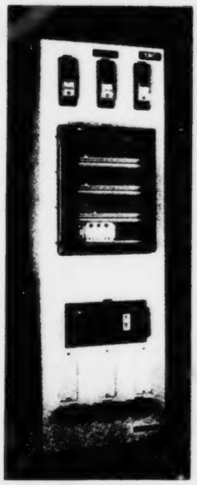
606 Beech Street, Whitby, ON L1N 5S2, Canada
Telephone: (416) 668-3348, Telex: 06-981269, Twx: 610-384-2754,
Cable: ANDCORP WHITBY

Andrew Antenna is a designer and manufacturer of specialized antennas and transmission lines used throughout the world. The company's products include a complete line of terrestrial microwave antennas covering 1 to 23 GHz (0.6 to 4.6m) and associated microwave components; a complete line of earth station antennas from 4 to 40 GHz (1.8 to 12m); waveguide and coaxial cable; air traffic and weather radar antennas; navigation and landing aid antennas; and special applications antennas designed to exacting customer requirements. The company offers fully equipped anechoic chamber and test range facilities, and production to internationally recognized government/military quality standards.

Andrew designed and manufactured products are a major feature of telecommunication installations around the world. Andrew Antenna operates as part of an international company with nine plants in four countries. Since its incorporation in Canada in 1953, the company has expanded its main plant to 12,000 sq m.

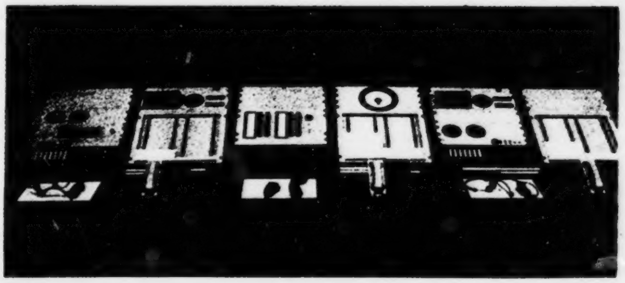


▲
ANDREW ANTENNA's 4.5 metre 4/6 GHz transportable earth station.



◄
BBC BROWN BOVERI: For more than 20 years, power line carrier equipment, as well as protection systems, manufactured in Canada, has been supplied to customers on all continents.

►
AUDOR COMMUNICATIONS INC specializes in the development, production, and turnkey installation of custom-made telephone and communications systems. Designed for an air traffic control tower, this system includes 7 radio channel controls with backups, nine intercom lines with conferencing, two hot lines and a host of other features.



ANTARES TELECOMMUNICATIONS INC.

38 Antares Drive, Nepean, ON K2E 7Z2, Canada
Telephone: (613) 727-0334

Antares Telecommunications Inc. designs and manufactures its BBD 600 and the BBD 610 executive desk organizer telephone sets, which combine a telephone with leather blotter, calculator and clock. Features of the telephone include 112-number memory, redial, hold-link and handsfree. The company is about to introduce a new family of telephone products including proprietary telephone sets. The company is currently exporting to the United Arab Republic and the US.

The manufacturing of telephony-related products and specialized devices was started in 1981. Antares produces its products in a modern manufacturing facility. Backed by a qualified technical team, the company offers full product service and warranty.

AUDOR COMMUNICATIONS INC.

2700 Lancaster Road, Ottawa, ON K1B 4T7, Canada
Telephone: (613) 523-9933, Telex: 053-3172

Audor Communications Inc. (ACI) specializes in the manufacture and turnkey supply of customized communication systems. Products and systems include air and marine traffic control communication systems; solid-state and micro-processor based radio/telephone patching, radio/antenna switch systems; Quasi Doppler direction finders and VHF transmitters/receivers; lightning protectors; digital clocks; and master-slave systems. Air traffic control and marine communications control systems are designed to customer requirements. The company also provides consulting services, installation and offshore training.

Although established in 1979, ACI has many years' experience in telephony and communications through its principal employees. Most of the firm's business is from the sale of custom VHF and UHF ground-to-air communications systems to offshore customers. ACI has been active in Malaysia, West Africa (Ghana, Togo, Ivory Coast, Guinea, Liberia, Sierra Leone), Mexico, Cuba, Algeria, the US, United Arab Emirates and Chile.

BAND ELECTRONICS LTD.

11927-95A Avenue, Delta, BC V4C 3W1, Canada
Telephone: (604) 581-9104

Band Electronics specializes in the manufacture of telecommunications and data equipment, including telephone systems, subscriber devices, central office equipment, and computer and data transmission boards for Telex, and so on, primarily for the OEM market. The company also has complete turnkey capabilities.

The company ships sub-assemblies to General Telephone and Electronics Inc. manufacturing plants in the US. Other export activity has involved supplying assemblies and systems to major Canadian manufacturers, including Microtel and Rockwell International of Canada, for incorporation into systems built for the Trans Arabian Pipeline, the Mexican Communications System and the Pakistan Communications System.

The company was established in 1974. It is also involved in PCB assembly, wiring and cable harnesses, test access modules and digital cross-connect equipment.

BBC BROWN BOVERI CANADA INC.

4000 Trans-Canada Highway, Pointe Claire, PQ H9R 1B2, Canada
Telephone: (514) 694-6220, Telex: 05-821542

Brown Boveri manufactures single-sideband power line carrier equipment (PLC) which is used to transmit various forms of information over high voltage power lines. A single unit can transmit voice, data or a combination of various forms of communications over a channel with a bandwidth equal to a standard voice telephony circuit.

In power system control applications, the following types of information may be transmitted: voice communication as part of a private telephone system; Telex messages as part of a private teleprinter network; power line protection control data or signals; teleoperations such as back indication, telemetry, transmission or regulation, and controlling values and meter readings; data transmission for computer and process control (SCADA); or photo-facsimile transmission.

Should transmission requirements exceed the capacity of a PLC channel, the single channel unit can be doubled, or several units can be connected in parallel to share a single coupling on the same power line. Information can be picked up, dropped off or passed through any in-transit station in a power line system.

BOSTON INSULATED WIRE AND CABLE COMPANY LTD.

P.O. Box 70, Station B, 118 Shaw Street, Hamilton, ON L8L 7V3, Canada, Telephone: (416) 529-7151, Telex: 061-8684

Boston Insulated Wire and Cable Company Ltd. (BIW) specializes in the design and specialty manufacturing of cable for harsh or unusual environmental conditions, primarily short-length cable requiring flexing. BIW has custom designed and supplied cables for applications in virtually every industry, including telecommunications, CATV, industrial, and oil & gas.

In addition to its corporate headquarters/manufacturing facility in Canada, BIW has a sister plant in the UK. Established in Canada in 1910, the company is a subsidiary of BIW Cable Systems of the US. It has BIW's territorial mandate for Australia and New Zealand. The company has also exported to Europe, South America, the US and the Far East.

C/D COMMUNICATION DEVICES INC.

670 Progress Avenue, Scarborough, ON M1H 3A4, Canada
Telephone: (416) 439-6320, Telex: 065-25428

C/D Communication Devices Inc. manufactures teledata components consisting of jacks, jack panels, coaxial components, attenuators, matrix selector switches, digital cross connect jackfields, rocker and toggle switches, patch cords, and fibre optic components. Much of the company's telephone jack equipment is custom designed and manufactured to customer requirements.

The company's principal export market is the US, where it has established a number of sales representatives. The company also exports in quantity to Great Britain, and has filled an order for a Taiwanese firm.

C/D Communication Devices Inc. is a privately-owned Canadian firm. The company operated as a division of Leecraft Industries Ltd., primarily a manufacturer of indicator lights and miniature lampholders, until 1983 when it was incorporated as a separate company.

CALGARY CONTROLS LTD.

7056H Farrell Road South East, Calgary, AB T2H 0T2, Canada
Telephone: (403) 253-6101

Calgary Controls Ltd. designs and manufactures state-of-the-art communications equipment, including specialized telephone products. Its product line includes voice frequency/DTMF communications, DTMF decoders, status alarm systems and voice facility data testing equipment.

The company was founded in 1970, and is a supplier to all major Canadian telephone companies. The firm also supplies specialized equipment to railroad and utility companies, and has exported products to the US.

CANADIAN LARSEN ELECTRONICS LTD.

149 West 6th Avenue, Vancouver, BC V5Y 1K3, Canada
Telephone: (604) 872-8517, Telex: 04-54666

Canadian Larsen Electronics Ltd. is a manufacturer of two-way radio antennas, including CB and cellular.

The company, which has been in business in Canada for 22 years, has exported its products to Australia and Indonesia.

CANADIAN MARCONI COMPANY

DataComm Products Division

P.O. Box 13330, 415 Legget Drive, Kanata, ON K2K 2B2, Canada
Telephone: (613) 592-6500, Telex: 053-4805

With over 15 years of experience in Telex switching, Canadian Marconi Company (CMC)'s DataComm Products division is a proven supplier to the worldwide telecommunications market. The company entered the field with the development of a Telex/TWX converter to handle switching protocol and code translation between TWX and Telex systems. This led to the CMA-745 international Telex gateway exchange, which evolved into the CMA-755 Telex exchange.

British Telecom PLC updated its national Telex network with CMC's CMA-755 multiprocessor Telex exchange. The $50 million contract was for the design, production and installation of 58,368 Telex line terminations across ten SPC Telex exchanges in the UK. The first exchange went into service in November, 1984, and one exchange cut-over each month until the entire system was operational in September, 1985.

Through contract extensions, CMC has worked successfully with British Telecom in the implementation of 75,000 lines of Telex for the Inland Telex Modernization Program. The exchanges range in size from 2,700 lines to 24,000 lines at the Keybridge exchange in London, the world's largest.

CMC's DataComm Products division developed the CMA-775, a Teletex/Telex conversion facility offering

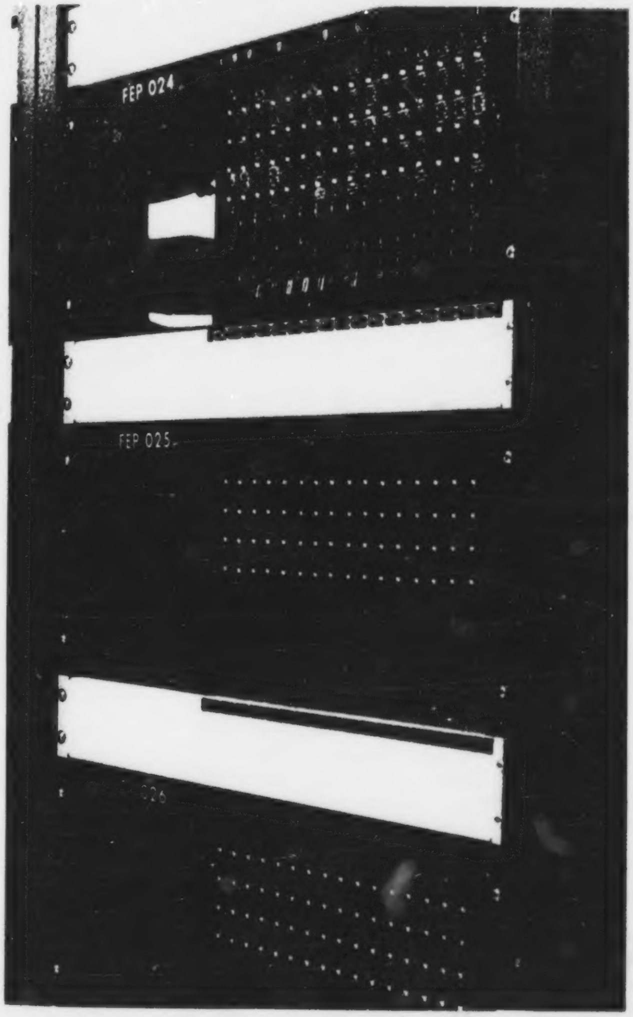
▶ CANADIAN MARCONI CO. employee loads computer disk onto a CMA-755 Telex data exchange. These systems have been installed at British Telecom plc, to update its national Telex network.

▶ OPPOSITE PAGE: CANADA WIRE, a major manufacturer and developer of communication's cable. Modern plants are combined with fine engineering and vigorous quality control to produce high quality communication cable.

bi-directional interworking between the Teletex and Telex services in full compliance with CCITT Recommendation F.201 and other relevant recommendations. A multi-microprocessor system employing distributed processing architecture, the CMA-775 currently interfaces to Telex service offered on the Public Telephone Switched Networks (PSTN) and Packet and Circuit Switched Public Data Networks (PSPDN and CSPDN). This division has also developed a small Telex switch for requirements between 200 and 5,000 lines.

Canadian Marconi Company is a diversified supplier of electronics and communications equipment for military and commercial markets. The company was founded in 1903 by Guglielmo Marconi, the genius who engineered and received the first trans-Atlantic wireless signal at Signal Hill, Newfoundland (on Canada's easternmost shore) in 1901. It operates independently of its principal shareholder, the General Electric Company PLC of the UK, which holds 51.6% of the outstanding common shares.

CMC has two major operating segments: the Electronics Group, comprised of Avionics, Components, Radar and DataComm divisions; and the Communications Group, consisting of the Defence Communications and Special Services divisions. Executive offices and major manufacturing facilities are located in Montreal and Ottawa. In addition, CMC has two US-based subsidiaries: CMC Electronics Inc., Eatontown, New Jersey; and Sun World Circuits Inc., Altamonte Springs, Florida.



CANADA WIRE AND CABLE LIMITED

250 Ferrand Drive, Don Mills, ON M3C 3J4, Canada
Telephone: (416) 424-5000, Telex: 06-219556, Cable: CANWIRLTD

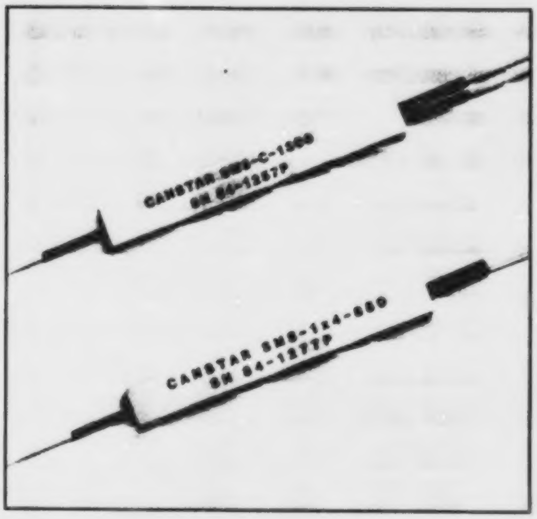
Canada Wire and Cable Limited is a wholly-owned subsidiary of the Noranda Group of companies which manufactures a broad selection of standard and custom products. The product range includes construction cables, control cables, magnet wires, medium and high voltage cables, cords, appliance wires, electronic wires and communications cables including fibre optics.

Canada Wire will custom engineer wire and cable products for specific customer requirements for virtually any application. Through its subsidiary, Canstar Communications, the company also offers the most advanced fibre optics technology (see separate listing for Canstar for more details). Datatrans (tm) Instrumentation Cables have been designed for process and system control applications up to 600 V while ensuring peak performance in the harshest environments. The company has recently invested $35 million (Cdn) into plant renovation and has expanded capacity to meet worldwide demand.

canada wire
canada wire

Canada Wire and Cable has ongoing experience in exporting wire and cable products and providing turnkey installations in 60 countries. It presently has distributors and maintains company-owned facilities in the Far East, the Middle East, South America, Europe and North America.

For over half a century, Canada Wire and Cable has provided leading edge technology for the telephone, telecommunications and defence industries throughout the world.



▲
CANSTAR Communications produces a wide variety of passive devices for fibre optic systems. Shown here is a single-mode fibre optic coupler (top) that converts one input into two outputs and similar type star coupler (bottom) which takes one input and produces four outputs.

CANSTAR COMMUNICATIONS

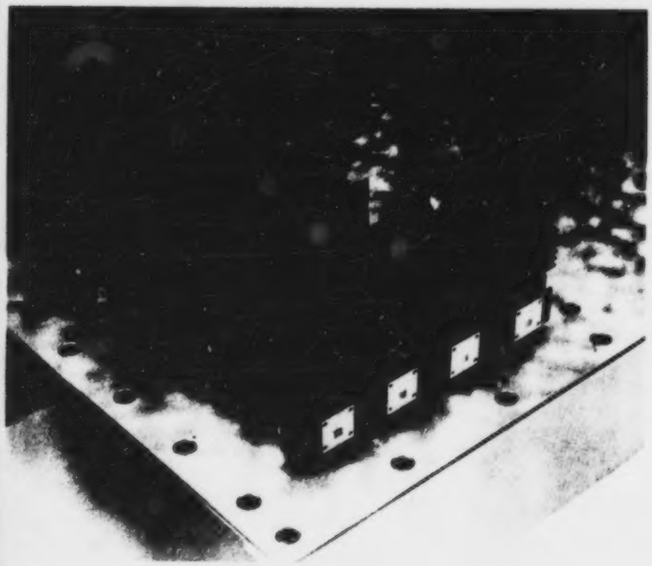
1240 Ellesmere Road, Scarborough, ON M1P 2X4, Canada
Telephone: (416) 293-9722, Telex: 065-25403

Canstar Communications offers a completely integrated capability to engineer, install and test complete turnkey lightwave communications systems. The company was established in 1977 to develop applications for fibre optic technology in communications systems. Canstar is a division of Canada Wire and Cable, a wholly-owned subsidiary of Noranda Mines Limited.

Canstar has the exclusive rights to build and market the fused biconical tapered coupler developed at the Communications Research Centre of the Canadian Department of Communications. Canstar has created a worldwide market for these couplers, and the technology has been sub-licensed by Canstar to other manufacturers of fibre optic couplers.

A full range of high quality fibre optic cables are manufactured by the company using the latest fibre optic production and testing equipment. The company maintains an on-going research and development program for optical coupler, optical line terminating equipment and local area networks.

▼
COM DEV LTD of Cambridge, ON, is one of Canada's leading suppliers of microwave components and subsystems for space and earth segment satellite communications systems. Shown here is a 14 Ghz 8-channel contiguous earth station multiplexer.



COM DEV LTD.

155 Sheldon Drive, Cambridge, ON N1R 7H6, Canada
Telephone: (519) 622-2300, Twx: 610-366-3164

COM DEV is a world leader in the design and manufacture of microwave components and subsystems for communications satellites and defence systems. Products include: a full range of waveguide components, spanning electromechanical devices and passive elements; switches; ferrite components; couplers; and filters. The company specializes in the integration of these key technologies to form custom, highly optimized, microwave assemblies.

The company has designed microwave subsystems for numerous communications, radar and EW applications. The majority of all microwave multiplexing subsystems presently being built for communications satellites worldwide are supplied by COM DEV. The company also has an active signal processing capability, specializing in the design of SAW devices. The use of digital electronics allows COM DEV to address a range of applications encompassing radar and EW.

The company also designs and manufactures state-of-the-art antenna subsystems, incorporating the beamforming network and the feed assemblies. The integrated design of passive microwave assemblies with antenna assemblies allows COM DEV to optimize system performance thereby saving on system mass and power.

COMTERM INC.

110 Hymus Boulevard, Pointe Claire, PQ H9R 1E8, Canada
Telephone: (514) 694-4332, Telex: 05-821812

Comterm Inc. designs and manufactures IBM-compatible and ASCII-type terminal systems (terminals, printers and controllers) with multilingual capabilities, and bilingual (French-English) IBM-compatible microcomputers. The company also supplies custom-designed office systems for individual office automation needs.

Since its first major contract to supply ASCII terminals with Arabic capabilities to Iran, Comterm has expanded into other Middle Eastern markets, and has had major contracts in Saudi Arabia and Egypt. The company is also active in France and the US, where it has recently installed a multilingual terminal system at the US Library of Congress.

In the microcomputer market, Comterm has just completed a contract to supply 9,000 bilingual

◀
COMTERM is a quality designer and manufacturer of micro-computers and IBM-compatible terminals.

▼
CONSULTRONICS' "AUTOTEST I & II" Modem testing system—automatic test system for modems and other telecommunications products. Provides computer controlled simulation of impairments typically found on communication lines as well as the digital control necessary to test virtually any voiceband modem. Software packages available for the IBM-PC and HP-85 computers.

IBM-compatible micros to Quebec schools, in association with Matra Datasystemes of Paris, France. The company is also currently involved in two office automation pilot projects with the federal Department of Communications and a Quebec government agency.

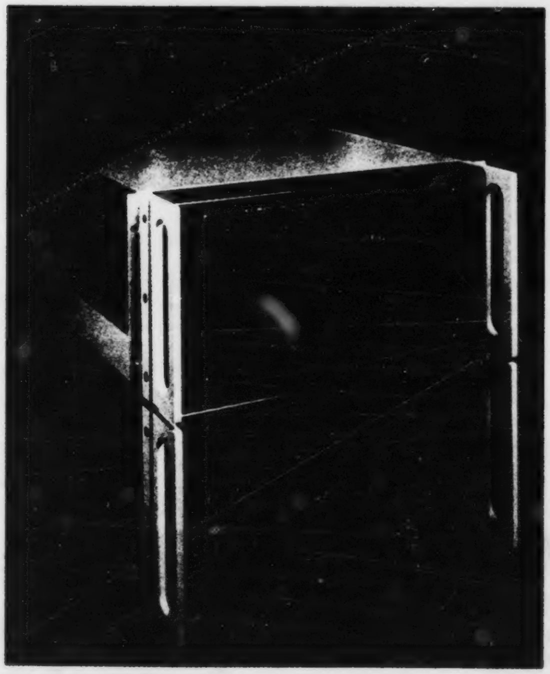
Comterm was incorporated as a subsidiary of Central Dynamics Ltd. in 1970 with a mandate to design and manufacture input devices for mainframes. It was later established as a separate firm with its own product development resources.

CONSULTRONICS LTD.

160 Drumlin Circle, Concord, ON L4K 2T9, Canada
Telephone: (416) 738-3741

Consultronics Limited specializes in the design and manufacture of specialized quality control instrumentation for the telecommunications industry. Products include digital network monitors for multiplexed transmission including DS-3, DS-1C, DS-1, DS-3, DS-3A, DS-4, 2.0 MB/S, 8.0 MB/S, 34 MB/S, 140 MB/S; down converters, DS-3 to DS-1; an analog transmission monitor; audio analyzer systems; power line monitors; modem test systems; transducers for the power industry; signal generators (low distortion); fixed frequency generators; and "Jitterbug", a hand-held phase jitter meter.

Consultronics had been in business for 15 years and has since gained a reputation as a creative problem-solver and quality producer. Its products have been exported to PTTs and telecommunications companies worldwide.



CYBERNEX LIMITED

1257 Algoma Road, Ottawa, ON K1B 3W7, Canada
Telephone: (613) 741-1540, Telex: 053-4419

Cybernex Limited is a designer and manufacturer of alphanumeric and graphic display terminals. Standard protocol terminals work on mainframes/minicomputers manufactured by Burroughs, Control Data, Digital Equipment, Data General, Honeywell, Hewlett Packard, IBM, MAI Basic Four, and others. Current graphics products include a 1024 × 780 resolution plug replacement for Tektronix 4014, a 1024 × 781 color resolution controller for Tektronix 4100 type applications, and a 1024 × 800 resolution NAPLPS decoder for high quality videotext uses. The company also performs custom work and sells licenses, where applicable.

Since Cybernex was founded in 1974, it has evolved into a world class designer and manufacturer of microprocessor-based video display terminals. The company currently exports to the US, UK, France, Belgium, Germany, Switzerland, Sweden, Italy, Singapore, Hong Kong, Australia and New Zealand. Cybernex has agreements with two US distributors, and is a major supplier to the various Contel companies.

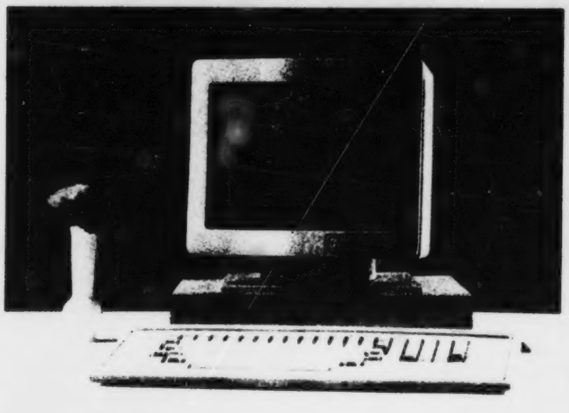
In Canada, Cybernex supplies major telephone companies, including Bell Canada, Maritime Telegraph & Telephone Co. Ltd. and Manitoba Telephone System.

DATAGRAM INC.

1451 Graham Bell, Boucherville, PQ J4B 6A1, Canada
Telephone: (514) 655-3200, Telex: 05-26821

Datagram specializes in the design, development, manufacture and maintenance of data communications equipment. The company has two major product lines: the intelligent statistical multiplexer with integrated data compressor software, which operates on a synchronous and asynchronous environment up to 54 ports, usually used in networking with mainframes such as IBM, H-P and Data General; and the cluster controller PABX and protocol converter for the Burroughs computer, featuring protocol conversion, concentration, addressable and non-addressable terminal switching and host computer switching. The company also manufactures modems and X.25 PADs.

From its inception in 1976 as a public corporation, Datagram has expanded its product line from a simple printer add-on to sophisticated communications processors and data compressors. The company has offices across Canada, and operates in the US through a wholly-owned subsidiary, Datagram Corp., responsible for marketing, distribution and servicing. Datagram has sold its products to companies in the UK and the Netherlands, and is planning to increase its export activities through new distributors and OEMs in Europe, Japan and Australia.



DATAP SYSTEMS

DIV. OF SWAN WOOSTER ENGINEERING LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS

DATARADIO INC.

1819 Dorchester Boulevard West, Suite 400, Montreal, PQ H3H 2P5, Canada, Telephone: (514) 932-6600, Telex: 055-60435

Dataradio Inc. designs and manufactures radio-based data communication equipment which provides error corrected point-to-point or point-to-multipoint transparent data communications in either synchronous or asynchronous environments. Included in its line of radio-based data transmission products is a series operating at 9600 bps (asynchronous modem, synchronous modem, full duplex digital repeater and a serial parallel unit), and a 2400 bps modem and station/store/forward single-channel repeater.

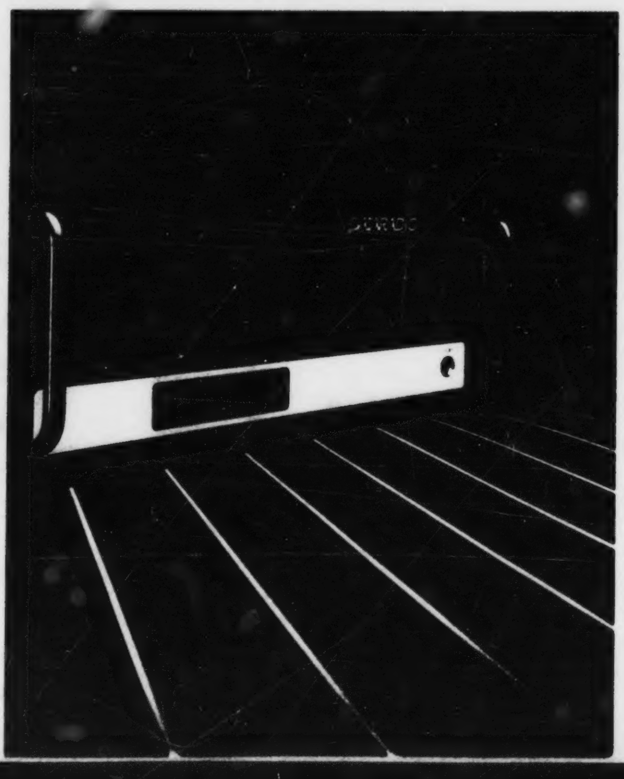
Dataradio has two direct sales offices and a network of sales representatives in the US. The company is active in Latin American and Pacific Rim countries, where it is involved in a number of field trials. Dataradio has technology transfer agreements with major radio firms in Mexico and Argentina, and markets through a distributor in the UK, where it is type-accepted by British Telecom.

Dataradio Inc. and its wholly-owned US subsidiary, Dataradio Corporation, are part of the Presud group of companies. The company was formed in 1980 to develop and market a thin route radio based data system first introduced in 1983.

DBA COMMUNICATION SYSTEMS INC.

1201 East 4th Street, North Vancouver, BC V7J 1G8, Canada
Telephone: (604) 985-9521, Telex: 04352848

DBA Communication Systems Inc. designs and manufactures multi-line telephone systems for small business applications. The company's principal products: are Simplex 10, a 4-trunk 10-station 1A2 type key tetephone system; and a new 2-trunk 8-station system which requires no common control unit, and provides line access, intercom, hold, paging and other features in a



self-contained proprietary telephone set.

DBA was established in 1979 to manufacture and distribute products under license for US-based Tone Commander Systems. The company soon moved into designing its own telephone products, and, with its newly developed two-line system, is currently seeking to increase export activity, beginning with the establishment of a US marketing subsidiary.

DEES COMMUNICATIONS ENGINEERING LTD.

6475C-64 Street, Delta, BC V4K 4E2, Canada
Telephone: (604) 946-8433, Telex: 04-357749

Dees Communications Engineering Ltd. specializes in the engineering and manufacturing of telephone peripheral equipment, the design of communication equipment for OEMs, and developing solutions to specific operating problems in the telephone industry, for both traditional telephone companies and the emerging interconnect industry. The product range includes electronic ringers for key and PBX systems, line sensing relays, an automatic ground start unit for PBX power fail mode, ANI units for central office and subscriber locations, ringer isolators, common ringer units, power supplies, an 8-trunk power fail transfer unit, and a complete tester for telephone sets.

Although Dees was formed in 1975, it only opened its first direct sales office in the US in 1985. Dees is planning to expand into the European market, starting with the UK.

DEVELCON ELECTRONICS LTD.

856-51 Street, Saskatoon, SK S7K 5C7, Canada
Telephone: (306) 664-3777, Telex: 074-2780

Develcon Electronics Ltd. makes data communications equipment used to transmit information among terminals, computers and other data processing equipment. The company has three product lines: switching, transmission and networking. Develcon's intelligent switching systems, which employ a software intensive modular design, include "Dataswitch" and an enhanced version called "Develswitch", both offering large capacity, flexibility and control over the communications network. The company's transmission product line consists of short-haul modems, low-, medium- and high-speed analog modems and statistical multiplexers. In networking, the company has developed a distributed data communications network called "Develnet", a technologically advanced networking system designed to overcome existing limitations of data communications between LANs.

From its origins in 1974, Develcon has grown into a multi-facility operation with subsidiaries in the US and Belgium, and distributors in 17 countries. The company's main export market is the US, and is now moving aggressively into other international markets. Develcon has been awarded a $5.2 million contract by NASA for a entire network at the John F. Kennedy Space Center, and a $1 million data network order from a firm in Germany.

DICTOGRAPH CORPORATION

107 Glen Cameron Road, Thornhill, ON L3T 1N8, Canada
Telephone: (416) 881-0074

Dictograph Corporation specializes in low-cost consumer and business automatic tone-pulse switchable telephone dialers, multi-line phones with multiple automatic dialing features built-in, and cordless dialers.

Among the company's products are the DIAL-IT-II, a small multi-function portable dialer featuring a 100 number memory, and the ADD-ON-DIALER, a console plug-in unit with similar features. This tone-pulse switchable design provides access to computers from rotary dial telephones and is compatible with all switching systems. The company also offers a low-cost multi-function, two-line telephone system.

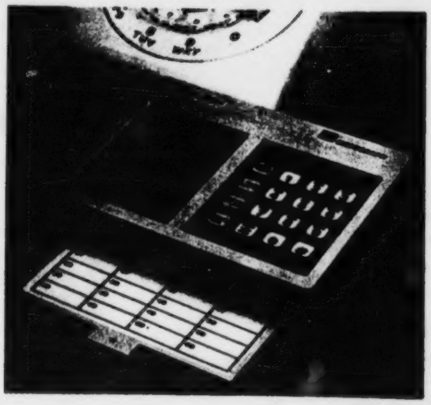
Dictograph began producing intercom systems in 1902, and expanded into consumer telecommunications products in 1979. Although the US is the company's primary market, Dictograph has shipped in quantity to Denmark, Norway, Singapore, Hong Kong, Saudi Arabia, the UK and Malaysia.

ELECTRO ARTS LTD.

235 Nugget Avenue, Scarborough, ON M1S 3L3, Canada
Telephone: (416) 293-1147, Telex: 065-26118

Electro Arts Ltd. specializes in the design and manufacture of data switching and data concentration remote test systems for telecommunications (data and voice)—"DVACS"—which includes hub cards, VF bridge cards, TDM cards, access cards and F1F2 subsets (modems).

The company, which has been in business in Canada for 14 years, has custom manufactured test systems for most major Canadian telephone companies and carriers, including CNCP Telecommunications. Electro Arts is currently expanding its US presence to better serve that market.



◀ **LEFT TO RIGHT:**

CYBERMEX LIMITED is a world-class designer and manufacturer of microprocessor-based video display terminals.

The DATARADIO 4800, which operates in either synchronous environments, is one product in Dataradio Inc.'s line of radio-based data communication equipment.

DBA's 2-line 8-station key telephone system is the company's newest telephone product for small business applications.

The ADD-ON-DIALER is one of the principal products of DICTOGRAPH CORPORATION, specialists in sophisticated, low-cost consumer and business telephone products.

ELECTROHOME LIMITED

809 Wellington Street North, Kitchener, ON N2G 4J6, Canada
Telephone: (519) 744-7111, Telex: 069-55449, Cable: DEIL KTCH

EXPORT SPECIALITY: Electrohome Limited's electronics division manufactures a wide range of commercial electronic products in three major product lines: large screen/data graphics and video projection systems; commercial satellite receiving equipment; and computer graphics videotex equipment to North American Presentation Level Protocol Syntax (NAPLPS) standards.

The top-end projection product is the ECP 2000, a high resolution color data/graphics or video projection system that can be used in boardroom conferencing, teleconferencing and training applications. Complementing that product is the EDP 58, a high brightness, high resolution monochrome projection system.

Electrohome's satellite communications products include receivers, modulators, and receiver/modulators for commercial satellite master antenna (SMATV), MATV, and CATV systems. The company has also developed a TVRO (television receive only) signal generator for simulating TVRO signals in a laboratory environment.

The company's videotex line is comprised of: set top terminals (decoders and keyboards); high resolution decoders and color graphics displays; and page creation, analysis and database debugging tools. These products are supported by custom software packages.

INTERNATIONAL EXPERIENCE: Electrohome's products have been exported to more than 30 countries including the United Kingdom, Australia, West Germany, Switzerland and Japan. The large screen projection systems are used by universities, government agencies, and private corporations in such countries as India, Japan, and Taiwan. Electrohome's videotex products have been shipped throughout North and South America, including a recent contract with Radio Victoria S.A.I.C. of Argentina for the supply of videotex decoders. Its satellite communications equipment has been shipped to commercial establishments in the US and Mexico.

The bulk of Electrohome's international sales are through dealers and distributors. The company maintains a sales office in England, which supports all products sold in Europe by the electronics group, and sales and service offices in the US.

COMPANY BACKGROUND: Incorporated as Dominion Electrohome Industries Ltd in 1933, Electrohome's origins date back to 1907 when it began manufacturing the first hornless phonograph. Today, Electrohome is a highly diversified company operating in three major business areas: industrial electronics and motors; consumer furniture and electronics services; and radio/television broadcasting, TV programming and advertising.

EXIDE ELECTRONICS CANADA, INC.

5200 Dixie Road, Unit 20, Mississauga, ON L4W 1E4, Canada
Telephone: (416) 625-9627, Telex: 06-961272

Exide Electronics Canada, Inc. manufactures a range of static uninterruptible power systems (UPS) in the range 15 to 750 kVA, 50 and 60 Hz three phase, 1.5 to 30 kVA single phase and 50/60 to 415 Hz frequency converters. High reliability solid-state modular design with built-in diagnostics and self-test features permit ease in maintenance and minimum downtime. Exide Electronics' systems have provided back-up power for a broad cross-section of utility and security installations, as well as for telecommunications requirements.

Exide Electronics' systems are used by major Canadian telephone companies and the company is prominent supplier for projects initiated by the Canadian International Development Agency and OEM turnkey suppliers. Current large contracts include the supply of 21 systems to Spar Aerospace for earth satellite systems in China, and ongoing supply of systems to Hughes Aircraft for integration into earth ground stations around the world. The company has also exported to the US, Swaziland and Bermuda Telephone.

Exide Electronics Canada, Inc. is a wholly-owned subsidiary of US-based Exide Electronics Corporation, and has been established in Canada for over 15 years. Exide Electronics Canada is involved heavily in engineering and research & development.

◀ **OPPOSITE PAGE:**

ELECTROHOME's sleek new 3rd generation ECP 2000 color data/graphics and video projection system is feature-packed with state-of-the-art technological advances. Ideal for fixed ceiling mount or other applications, the '2000' has a new lens that provides optical resolution of 1200 lines; has VARI-VOCUS which permits varying picture sizes 5' through 14' diagonal; has new pincushion circuitry for perfect picture geometry; and locks on automatically to scan frequencies 15,000 to 33,000 KHz horizontal and 45 to 100 Hz vertical.

▲ **TOP:**

This series 2000 uninterruptible power supply (UPS) system from EXIDE ELECTRONICS CANADA INC. is considered a breakthrough for small systems users. Exide manufactures a wide array of high reliability solid-state modular sytems with built-in diagnostics and self-test features permitting ease in maintenance and minimum downtime.

▲ **ABOVE:**

EXTEL's ComExpert, professional message communications.

▶

FERRANTI-PACKARD: National network control centre display, Saudi Telecommunications.

EXTEL COMMUNICATIONS (CANADA)

Division of NEI Canada Limited

121 McPherson Street, Markham, ON L3R 3L3, Canada
Telephone: (416) 475-1693, Telex: 06-966895, Twx: 610-492-4459

Extel Communications (Canada) is dedicated to the design, manufacture and sale of telecommunications terminals and related products, principally for Telex applications. The company offers a two-port terminal for Telex and Mailbox systems, four-port terminals for a broad spectrum of applications, and a 24-port message switch.

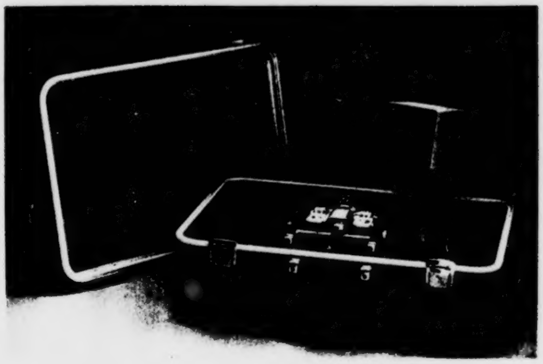
Extel, which has been active in Canada since 1974, has terminals in use in more than 110 countries. Extel sells to PTTs and International Record Carriers such as CNCP Telecommunications and Cable and Wireless.

FERRANTI-PACKARD ELECTRONICS LTD.

6030 Ambler Drive, Mississauga, ON L4W 2P1, Canada
Telephone: (416) 624-3020 Telex: 06-961437

Ferranti-Packard Electronics Ltd. designs and builds electronic light reflecting displays brandnamed DATARAMA. These status displays provide a unique real-time display for monitoring communications networks, power distribution systems, industrial processes or equipment status. They have excellent visibility in all light conditions, are highly reliable and very economical to operate.

A subsidiary of NEI Company, Ferranti-Packard Electronics has installed DATARAMA displays in more than 30 countries for customers such as AT&T, Bell Canada, Alberta Government Telephones, L.M. Ericsson and Saudi Telecommunications.



FOUNDATION INSTRUMENTS INC.

24 Colonnade Road, Nepean, ON K2E 7J6, Canada
Telephone: (613) 226-4000, Telex: 053-4153

Foundation Instruments Inc. specializes in the research, design. development and manufacture of fibre optic equipment for the communications industry. Products and systems include single-mode and multi-mode transmission systems for video, data and voice; an "intelligent" single-mode and multimode fusion splicer; a 20-channel asynchronous data multiplexer with speeds up to 56 kb/s; a multimode portable fusion splicer; optical fibre cable; and optical attenuation test equipment; plus all supporting hardware components required in a system. The company also offers custom design and development.

Foundation began operations in 1977. Foundation has completed a number of projects for major telephone companies. Its first significant contract was for the design. building, testing and installation of all components of the communications system for one of Bell Canada's early fibre optic trial systems in 1978, which was quickly followed by other large projects for that customer. Foundation has supplied satellite entrance links for broadcast video networks to Mexico, telegraph and telephone products to the US and the UK, and communications systems to Norway.

GANDALF DATA LIMITED

100 Colonnade Road, Nepean, ON K2E 7M4, Canada
Telephone: (613) 226-6500, Telex: 053-4728

EXPORT SPECIALTY: Gandalf Data Limited manufactures digital data communications equipment and information network equipment, linking terminals and computers to telephone lines and local networks that access host computers and other information facilities. The company stimulated the application of local data networks with the development of local and mid-range modems in the early 60s. Gandalf now offers a wide selection of modems in seven basic types: long-haul, dial-up, local and mid-range modems; line drivers, modem eliminators and modem multipliers.

Gandalf also has a extensive line of muliplexers for a variety of networking solutions. The multiplexer line is comprised of frequency division (data over voice), time division and statistical multiplexers, including SWITCHMUX, an intelligent switching/multiplexing system which provides four node local area networking of up to 64 devices.

Some of the company's more sophisticated offerings include its Private Automatic Computer exchanges (PACX), including its new PACX 2000, a fully distributed network switch. The PACX 2000 allows a variety of personal computers and other intelligent devices to be interconnected via a wide array of transmission media such as baseband, broadband, fibre optic or standard telephone twisted pairs.

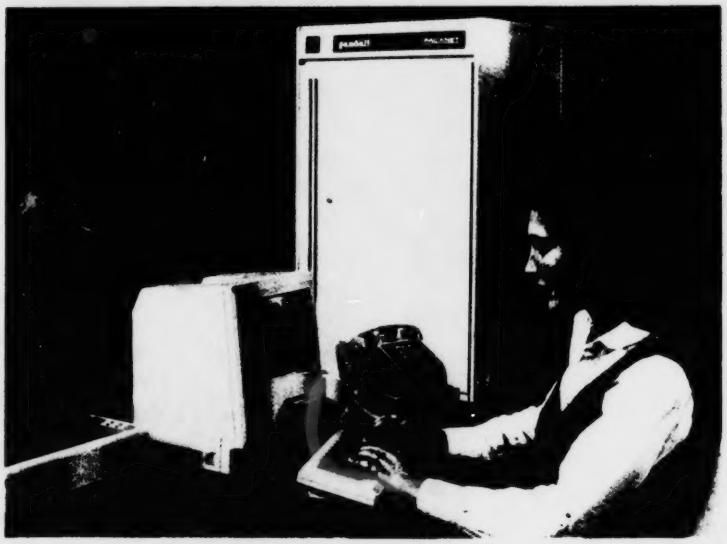
INTERNATIONAL EXPERIENCE: Gandalf's products and network systems have been sold in more than 25 countries. The company's international sales network is made up of direct sales operations in the US, UK, Holland and Australia, and distributors in the US, Europe, Asia, Australia and Venezuela. Gandalf is also expanding in the Middle East and Africa. Gandalf's major international clients include: BellSouth Services, an affiliate of US-based Southern Bell Telephone and South-Central Bell Telephone Company, which chose Gandalf as its supplier of limited distance modems; and the University of Melbourne in Australia, which recently upgraded its PACX 1000 systems with the PACX 2000.

COMPANY BACKGROUND: Gandalf was founded in 1970. During the first five years the company expanded rapidly, and by 1975 it established an American affiliate which began to assemble and market the Gandalf product line in the US. Two years later it formed a third affiliate in the UK, Gandalf Digital Communications Ltd.

In 1980, the three companies, which had operated

▲
FOUNDATION INSTRUMENTS INC. The PFS-200SM "intelligent" single-mode and multimode fusion splicer is one of the fibre optic products designed and manufactured by Foundation Instruments Inc.

▶
The PACX 2000, shown here behind the terminal operator, is GANDALF DATA LTD's newest distributed data switching system offering. The product of three and half years of development, the system can handle up to 20,000 subscribers through a network of up to 32 nodes.



independently up to that time, were restructured to become wholly-owned subsidiaries of Gandalf Technologies Inc. In addition to its manufacturing mandate, Gandalf Data undertakes most of the research and development for the Gandalf group of companies.

GLENAYRE ELECTRONICS LTD.

1570 Kootenay Street, Vancouver, BC V5K 5B8, Canada
Telephone: (604) 293-1611, Telex: 04-354808

Glenayre Electronics Ltd. specializes in advanced mobile radio communication systems. Products and systems include mobile telephone control terminals and control heads, VHF/UHF base stations, paging and voice message retrieval systems, analog/digital paging transmitters, automated telephone answering systems, VHF radio data modems/HF radio data terminals, and DC/DC converters. The company offers a wide range of standard products, as well as complete systems engineering to customer requirements.

A supplier of communication systems since 1969, Glenayre's mobile telephone systems include IMTS, AUTOTEL, combined IMTS/cellular, and fixed rural models. The company supplies mobile telephone terminals to customers in the US, Mexico, the Middle East, Central America and China, and its radio paging terminals are shipped to Europe, China and the US.

GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.

P.O. Box 400, Bassano, AB T0J 0B0, Canada
Telephone: (403) 641-3512, Telex: 03-848141

Global Thermoelectric Power Systems manufactures high reliability thermoelectric generators suited for power generation at remote, unattended telecommunications repeaters, and for other uses requiring up to 1 kW of dc power. The company specializes in custom engineering, design, manufacturing and installation of fully-integrated power systems for unique applications for any climatic extreme.

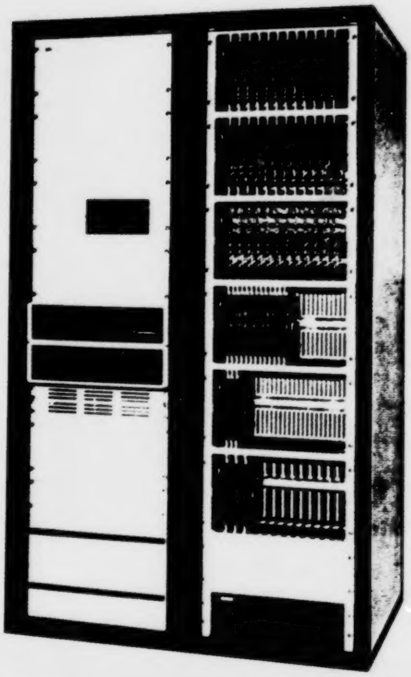
Established in 1975, Global is active internationally in the telecommunications and petroleum industries. The company has installed about 4,000 power systems in over 40 countries, including PTT sales to Algeria, the Ivory Coast, Senegal, Madagascar, Saudi Arabia, Abu Dhabi, Finland, Denmark, Oman and Pakistan.

GNB BATTERIES (CANADA) INC.

4500 Dixie Road, Unit 9B, Mississauga, ON L4W 1V7, Canada
Telephone: (416) 624-1107, Telex: 06-960377

GNB Batteries (Canada) Inc. manufactures lead acid stationary batteries from 10 to 8000 ampere hours for central office, PBX, microwave and UPS applications requiring dc back-up power. GNB also assists in the engineering and procurement of other components of power systems, rectifiers, DC distribution and inverters. The company offers a complete range of totally sealed Absolyte maintenance-free batteries in easy-to-assemble modules. GNB also offers on-site engineering and installation supervision of power plants (batteries, battery stands, racks and bus work).

GNB Batteries (Canada) Inc. (formerly Gould Manufacturing of Canada Ltd.) is a wholly-owned subsidiary of GNB Batteries Inc. of the US, a major independent battery company. GNB operates a plant in Canada where it has manufactured flat plate, lead calcium and lead antimony batteries since 1952. The company has supplied its products for requirements in the Middle East, South America and the Indian Subcontinent.



▲ TOP:
GLENAYRE's GL-RNS3000 combines a full-function, state-of-the-art radio paging terminal with a high-quality voice storage and retrieval system with up to 46 hours of message capacity.

▲ BOTTOM:
GLOBAL generators are powering a microwave repeater station in Southern California.

HARRIS FARINON CANADA INC.

657 Orly Avenue, Dorval, PQ H9P 1G1, Canada
Telephone: (514) 636-0974, Telex: 05-821893, Twx: 610-422-4122

Harris Farinon Canada, Inc. is a producer of low/medium capacity analog and digital microwave radios and accessories for point-to-point or point-to-multipoint communication links. The company also offers complete turnkey systems and engineering services.

Farinon equipment and systems are operating in over 120 countries. Customers are primarily in the industrial and military sectors, and has made several sales to PTTs in Europe and the Middle East.

Harris Farinon has been established in Canada since 1964. The company is a subsidiary of US-based Harris Corporation, a manufacturer of a complete line of telecommunications products and systems.

IDACOM ELECTRONICS LTD.

9411-20 Avenue, Edmonton, AB T6N 1E5, Canada
Telephone: (403) 450-2468, Telex: 037-3315

Idacom Electronics Ltd. specializes in the design and manufacture of sophisticated data communications testing equipment. Its product line includes a pari of easy-to-use protocol testers with expandable interface capabilities. Both testers are offered in standard or custom packages, allowing custom configuration by the user.

Idacom's testers are widely used by large North American telephone companies, and are gaining recognition internationally. The company was recently selected by Nippon Telegraph & Telephone to supply testers for its requirements.

The testing technology was originally developed at Alberta Government Telephones, a regional Canadian telecommunications carrier. The development team set up Idacom Electronics in 1981 to further develop it and to market data communications equipment. The company has sales offices in Canada, the US, and Germany.

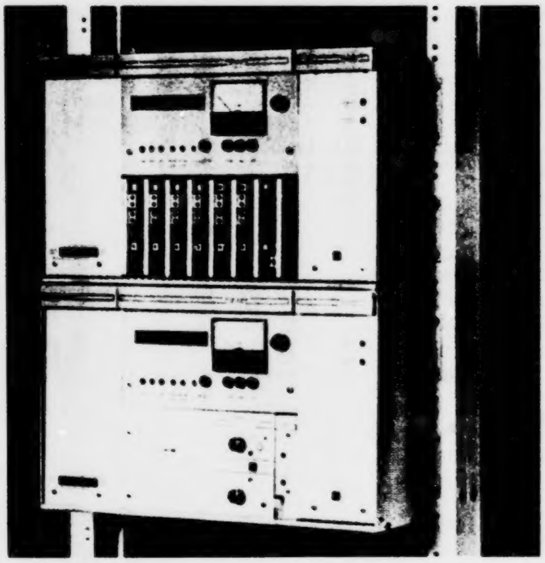
INTERCONTINENTAL DATA CONTROL CORP. LTD. (INTERDACO)

2373 Stevenage Drive, Ottawa, ON K1G 3W1, Canada
Telephone: (613) 733-4440, Telex: 053-4274

Interdaco manufactures a range of data transmission products, encompassing TDM multiplexers, loop adapter systems, speech-plus-data subscriber sets, frequency division multiplexers and related ancilliary products. The company ships to several countries, most notably in the Far East, Africa and South America.

One of Interdaco's major offshore contracts is a five-year, $12 million agreement with the Malaysian government-owned Pernas Engineering, to supply Jabatan Telekom, Malaysia's national telegraph and telephone company, with 550 TDM units. Other notable contracts include an ongoing agreement to supply multiplexer technology and equipment to the Indian Telephone Industries Ltd., and an order from the Telecommunications Organization of Thailand for the supply of loop adapter systems for Telex switching offices. The company has a network of agents covering 40 countries.

Interdaco was established in 1978 to design and manufacture high capacity, cost-effective multiplexers. It has over 100 customers worldwide, primarily national and international telephone and telegraph carriers.



▲
HARRIS: LR2-2000 narrowband microwave radio for 1.7-1.9 GHz. An economical system for up to 132 channels.

▶ **OPPOSITE PAGE:**
Communications site in the remote, rugged Canadian Rockies. LEBLANC & ROYLE supplied and installed this tower and the antennas.

LAB-VOLT LTD.

4555 Metropolitain Boulevard East, Suite 102, Montreal, PQ H1R 1Z4, Canada, Telephone: (514) 376-2120, Telex: 05-25415

Lab-Volt Ltd. designs and manufactures technical training systems which combine courseware and hardware in modular, mutually compatible, up-to-date, comprehensive and practical training programs.

The company offers training systems in a number of technical fields, including electricity and electronics, digital and microprocessor, electric power, and telecommunications. Lab-Volt's Telecommunications Training System encompasses practical electricity and electronics fundamentals; fundamentals for AF communications; fundamentals for RF communications; digital electronics; analog and digital telecommunications; and advanced systems-level analog and digital communications. The company is also developing microwave telecommunications, radar and antenna systems training systems.

Lab-Volt has supplied technical training systems for over 50 years. The company has sales offices in Australia, Brazil, Colombia and England.

LEBLANC & ROYLE TELECOM INC.

P.O. Box 880, 514 Chartwell Road, Oakville, ON L6J 5C5, Canada
Telephone: (416) 844-1242, Telex: 06-982226

LeBlanc & Royle Telecom Inc., established in 1962, is a designer, manufacturer and installer of communication towers and masts used for telecommunications, microwave, television, radio, defence, security and other communications applications. The company specializes in a full range of guyed masts from 10 inch to 12 foot face and heights up to 2300 feet, as well as self-support towers up to 800 feet.

LeBlanc & Royle provides total engineering, manufacture and construction services, or any combination of individual services related to the construction and continuing operation of communication towers and masts. This service includes electrical and radio frequency testing of all types of antenna systems.

LEIGH NAVIGATION SYSTEMS LTD.

7 Bovis Drive, Pointe Claire, PQ H9R 4W3, Canada
Telephone: (514) 695-8130, Telex: 05-821529

Leigh Navigation Systems Ltd. (LNS) is a systems integrator specializing in communications and air traffic control systems, and has recently designed a radio spectrum monitoring system specifically for PTT applications. The company's range of products includes mobile air traffic control tower systems, fixed air traffic control tower systems, communications systems, 909E communications switch systems, and radio spectrum monitoring systems.

LNS has been in business since 1971, designing specialized systems to meet particular operational requirements. All LNS systems are assembled, tested and operationally verified at the company's 3,700 sq. m facility. LNS has over 60 systems installations in over 20 countries in the Middle East, South America, South East Asia and the US.

LINCOM INTERNATIONAL COMMUNICATIONS

DIV. OF FISHER TECHNOLOGIES INC.

99-9865 West Saanich Road, Sidney, BC V8L 3F1, Canada
Telephone: (604) 656-0958, Telex: 04-97435

Lincom International Communications is a turnkey supplier of satellite-based border monitoring security systems. Its package combines mobile satellite uplinks, capable of operating in all Intelsat frequencies, and a variety of superminicomputers to provide fully encrypted video and voice/data communications for checking identification at border traffic points. Lincom has provided its systems to four countries in Europe and the Middle East.

Lincom is a wholly-owned subsidiary of Fisher Technologies Inc., a holding company incorporated in 1984.

LINDSAY SPECIALTY PRODUCTS LTD.

50 Mary Street West, Lindsay, ON K9V 4S7, Canada
Telephone: (705) 324-2196, Telex: 06962-860

Lindsay Specialty Products Ltd. manufactures antennas for broadcast, cable television and communications; a full line of TVRO satellite dishes; and a complete line of cable TV hardware including trunk bridger stations, line extenders to 500 MHz, mini-trunk and trunk bridger combinations with power doubling, line passives to 550 MHz and subscriber taps to 500 MHz, and a complete range of coaxial connectors and subscriber drop material.

The company's principal export market is Belgium. Over the past 14 years, Lindsay has also exported to Switzerland, Ireland, Austria, Saudi Arabia, Australia, Israel, the US, Holland and China. The company has distributors in Belgium and Ireland.

Lindsay Specialty Products was established in 1953 as a manufacturer of antennas for the domestic market. The company soon moved into commercial grade antennas, and then expanded into cable television hardware.

McCURDY TELECOMMUNICATION PRODUCTS LIMITED

70 Milner Avenue, Unit 2, Scarborough, ON M1S 3P8, Canada
Telephone: (416) 291-6449, Telex: 06-963533

McCurdy Telecommunication Products Limited specializes in the design and manufacture of program equipment for use in audio information transmission from the studio to the transmitter via common carrier networks. The 15 year old company has a broad base of experience in providing solutions for connecting voice grade signals from the switched telephone network into the studio equipment to enable broadcasters to use the signals on the air.

McCurdy's principal export market is the US. Its products include: a conference system that can handle up to four incoming calls for "on air" programs; a microprocessor-controlled, full duplex hybrid system designed for situations where one telephone line has to be interfaced to studio broadcast equipment without the subjective annoyance of a 'switching' hybrid; amplitude and phase equalizing equipment for common carriers; and spectrum translator transmitters and receivers for broadcasters and common carriers to provide subjective "5 kHz" quality from "3 kHz" voice lines.

MECHRON ENERGY LTD.

2437 Kaladar Avenue, Ottawa, ON K1V 8B9, Canada
Telephone: (613) 733-3855, Telex: 053-4271

Mechron Energy Ltd. specializes in the production, installation and maintenance of custom-engineered power systems. These systems usually operate unattended, in harsh climate conditions and with minimal maintenance. The product line includes diesel prime power systems, photovoltaic power systems and hybrids, standby diesel gensets, uninterruptible power systems, and dc power systems. Mechron also provides service, parts and training to customer requirements.

In addition to its turnkey capability, the company works in multidisciplines of electrical, electronic, mechanical and thermal designs. Systems can be factory-packaged and tested for one-piece shipment in its shelter. Microcomputer facilities can be provided for remote monitoring, diagnosis and control of the power plant.

Mechron has been in business for 36 years. The company has equipment operating in Africa, Asia, the Caribbean, the Middle East and South America.

MEMOTEC DATA INC.

600 McCaffrey Street, Montreal, PQ H4T 1N1, Canada
Telephone: (514) 738-4781, Telex: 05-824228

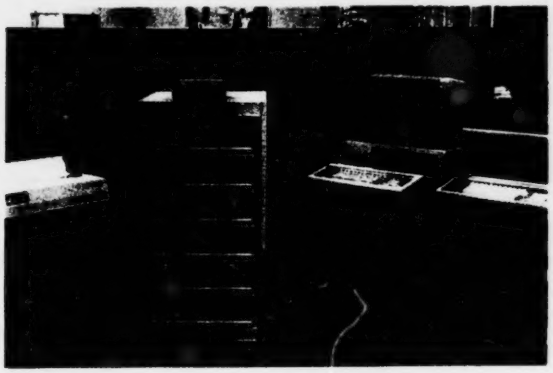
Memotec Data Inc. has been marketing X.25 communications products since 1977. Its data communications division designs, manufactures and markets sophisticated communications processing products which permit customers to link computers, terminals, personal computers, word processors and other electronic devices through X.25 communications.

Memotec products have worldwide acceptance network certification and compatibility. They include: packet assemblers/disassemblers (PAD) concentrators, for transferring data from a variety of computers to packet switching networks; switching processors to route and concentrate X.25 data from many terminals through one physical port; multi-protocol switching nodes to integrate a variety of computers and related components on one network, allowing businesses to access a packet switching network through a single entry point; and network control center (NCC) software programs for network management and configuration and network billing and statistics.

Memotec maintains direct sales offices in Canada and the US, and is building a distribution network in the UK, Western Europe and the Pacific Rim.

▶
MECHRON ENERGY: A typical prepackaged power supply for a variety of environments and applications.

▼
MEMOTEC's product range of packet assemblers/disassemblers/concentrators and switches.



MICROTEL LIMITED

401 West Georgia Street, Suite 2100, Vancouver, BC V6B 5C8, Canada
Telephone: (604) 683-3575, Telex: 04-354603, Twx: 610-922-6096

EXPORT SPECIALTY: Microtel Limited is a principal Canadian manufacturer of telecommunications equipment. Products for export markets include: analog multiplex equipment using direct-to-line modulation techniques; System 51, a control, supervisory and communications management system for all types of telecommunications networks (microwave, satellite and fibre optics), supplied with intelligent remote terminal units; ENTERPHONE, a door entrance control and communications system; and DAXCON, a digital access and cross-connect system for pulse code modulated lines.

A noteworthy recent development is Spacetel, a thin-route satellite communications system that functions in single channel per carrier (SCPC) environments. Spacetel operates in either Ku- or C-band frequencies and can be configured in either Star or point-to-point communications networks. The system is the backbone transmission facility for the Canada-US North Warning System. Microtel is part of the consortium building the $260 million network linking remote Arctic radar sites to control centres in Canada and the United States. The company is also providing its System 51 and some switching equipment for the system.

Microtel's services encompass design, manufacturing, delivery, installation, commissioning, training and operations and maintenance support for its entire product line.

INTERNATIONAL EXPERIENCE: Microtel's products and capabilities serve communications carriers, utilities, resource industries, military and government agencies in 68 countries. Among its recent international accomplishments, it has supplied System 51 to the Electricity Generating Authority of Thailand to supervise and control EGAT's national telecommunications network and to the Post Telephone and Telegraph of Italy to monitor and control microwave networks in Southern Italy.

Other prominent international achievements include delivery of single channel analog multiplex equipment to Telecomm Australia for communications to remote communities and pipelines between Perth and the Dampier oil fields; and the supply of microwave radio and analog multiplex equipment to Petroleos Mexicanos (PEMEX) to furnish communications connecting all of its exploration sites to its offices in Mexico. Microtel has also enjoyed considerable success in the US market where it has made 10 installations of System 51 and where it recently won its first export order for the Spacetel system.

Continues on next page

SPACETEL
SPACETEL

▲
MICROTEL: A member of the Canada Armed Forces utilizes Space Tel satellite communications which provides immediate voice and data service to remote areas.

◀
MICROTEL: Screen printing thick-film ink onto a ceramic substrate.

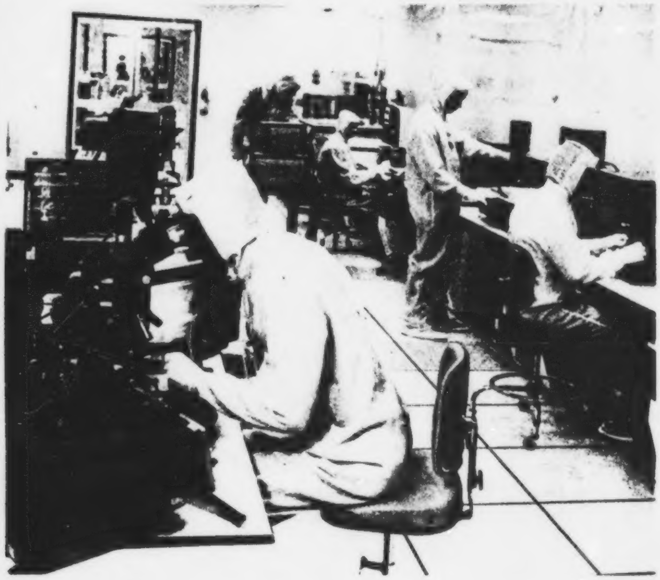
COMPANY BACKGROUND: Microtel is a wholly-owned subsidiary of British Columbia Telephone Company, Canada's second largest telecommunications carrier. Prior to June 1984, Microtel was known as AEL Microtel, a company formed in 1979 out of the merger of GTE Automatic Electric (Canada) Ltd., a specialist in telephone switching and subscriber equipment, and GTE Lenkurt Electric (Canada) Ltd., whose expertise was in the transmission side of telecommunications.

Soon after the amalgamation, their respective research and development departments were joined as a new subsidiary, Microtel Pacific Research (MPR) Ltd. MPR opened a new research laboratory in 1982 which today employs 326 scientists, engineers and support staff. Another major milestone for MPR was the opening in 1984 of its $7 million Pacific Microelectronics Centre which handles the design, testing and packaging of LSI/VLSI microchips.

Microtel's other subsidiary is Viscount Industries, whose chief area of expertise is telecommunications test equipment and the production of the ENTERPHONE door entrance control and communications system. Acquired by Microtel in 1980, Viscount continues to provide custom manufacturing services.

Microtel also supplies custom manufacturing through its Manutronics division, whose capabilities include backplane wiring, metal fabrication, printed circuit board fabrication and thick-film circuit manufacturing. The firm also offers specialized telecommunications training and educational services through Microtel Learning Services (see separate listing).

Microtel carries out production in two factories located in Canada, and the company also maintains direct marketing/sales offices in Canada and the US.



▲
MICROTEL: The Pacific Microelectronics Centre 'clean room' for designing, testing and packaging VLSI microcircuitry is the first facility of its kind in Western Canada.

MICROTRONIX SYSTEMS LTD.

120 Bessemer Road, London, ON N6E 1R2, Canada
Telephone: (519) 681-3430, Telex: 064-5642

Microtronix Systems Ltd., established in 1970, designs and manufactures telephone testing equipment, specializing in acoustical testing to international standards, and dial & ringer testing. Its Telephone Test Set fully integrates all important tests in one system, and displays various loudness ratings, fully measures DTMF and rotary diallers, measures the fundamental frequencies and amplitudes of an electronic ringer and provides automation control features that eliminate operator intervention. The modular design allows custom expansion to accommodate special interfaces.

MITEC ELECTRONICS LTD.

104 Gun Avenue, Pointe Claire, PQ H9R 3X3, Canada
Telephone: (514) 694-6666, Telex: 510 101-2790

MITEC Electronics Ltd. specializes in the design and manufacturing of microwave components and subsystems for telecommunications systems, earth satellite stations and defence systems. In addition to its standard product line, the company builds a full range of custom-designed microwave components.

MITEC has been exclusively involved in microwave technology since 1971, and has supplied over 300 customers in North America and Europe since the mid-70s. MITEC has manufacturing facilities in Canada and the US, and maintains regional sales offices and warehouses in North America and England. The company has representatives in France, Germany, Israel, Taiwan, Australia, South Africa, Italy, India and Brazil.

▲
From the MITEL product family, a two-cabinet SX-200/Generic 1000. The LCD-based console for SX-200/Generic 1000 as well as the Superset 3 and Superset 4 phones.

◀
MITEL: The advanced tone control card of an SX-2000 ICS is visually inspected, while Customer Data Entry is examined using a Superset 7 workstation, during final system test.

MITEL CORPORATION

350 Legget Drive, Kanata, ON K2K 1X3, Canada
Telephone: (613) 592-2122, Telex: 053-4596, Twx: 610-562-8529

EXPORT SPECIALTY: Mitel Corporation is Canada's second largest manufacturer of telecommunications equipment. Its core line of private automatic branch exchanges (PABXs) are supported by the manufacture of semiconductor devices, specialized telephone sets and call cost accounting equipment to provide a comprehensive range of communications services. All new products are also designed to interface with integrated services digital networks (ISDN).

Mitel's SX-2000 Integrated Communications Systems is an advanced digital voice/data PABX which supports up to 4,000 lines and whose capacity will ultimately be extended to 10,000 lines through digital networking. Features include an Automatic Route Selection package that includes least cost routing, an integrated telephone directory and extensive re-routing class of service, and class of restriction options.

Mitel also produces a family of SX (Superswitch) digital and analog PABXs that handle from 16 to 350 telephone extension lines. In 1985, Mitel began shipping a new digital switching system, SX-200/Generic 1000 which uses the same digital technology found in the SX-2000. The SX-200 is accompanied by the SX-100, SX-20, SX-10 and Super 10 systems.

Mitel's other products include the DART (dialed activity reporting terminal) which, when interfaced with PABXs, is an effective telephone cost management tool; and a family of specialized telephone sets, including Superset 4, Superset 3 and Superset 7.

INTERNATIONAL EXPERIENCE: With sales to more than 80 nations, almost half of the company's total revenues from PABXs and other telecommunications products, integrated circuits, licensing and technology transfer agreements are from customers outside of Canada and the United States.

Product internationalization is built into the corporate design philosophy, enabling it to meet local technical standards for safety and interconnection in all the markets it serves. Its products and systems are sold to telephone companies, distributors and installation companies who in turn rent or sell equipment to end-users.

The corporation has earned about 25% of the world market for PABXs up to 100 lines, a segment which constitutes about 40% of the international demand for PABXs. A major share of Mitels' market share has been occupied by the SX-100 and SX-200 family, of which some 40,000 systems have been installed. Since shipments of its SX-2000 began in 1984, Mitel soon received approval to connect the large PABX to public networks in eight countries.

Mitel provides training, service assistance and technical support. The company maintains offices in Latin America and the Far East, Europe, the Middle East and Africa. Mitel also employs over 150 people in sales and marketing in eight US cities.

Among its most recent international achievements are the supply of SX-2000, SX-200, SX-20 and Super 10 PABXs to the Post and Telecommunications Corporation of Zimbabwe; a licensing agreement with Arfeen International of Karachi, Pakistan for the production of its Entrepreneur and SX-20 PABXs; and a technology transfer pact with the Ministry of Chinese Electronics Industry (Administration of Computer Industry) for the production of SX-200 PABXs.

COMPANY BACKGROUND: Mitel is a subsidiary of British Telecommunications plc, which acquired a 51% interest in the company in early 1986. The company operates 12 production facilities and 35 sales and service offices in 14 countries. As of February 1985, its production capacity totalled over 155,000 sq m with plants in Canada, the US, Mexico, Hong Kong, New Zealand, the UK, and West Germany.

Mitel was founded in 1973. Its first product was a tone receiver, an electronic device used to translate the tones received from Touch-Tone telephones into electronic signals. In 1975, Mitel combined large scale integrated (LSI) circuit technology with its tone receiver to develop a tone-to-pulse converter, a major breakthrough in the application of custom LSI technology to solve specific technological problems of telephone companies.

To bolster its LSI circuit capabilities, Mitel the following year acquired a semiconductor manufacturing facility and formed a subsidiary, Mitel Semiconductor Inc. The company subsequently developed and manufactured a unique crosspoint switch which enabled it in 1978 to design the first in a series of PABXs, now the backbone of the company's business.

MOBILE DATA INTERNATIONAL INC.

Riverside Industrial Park, 11411 Number 5 Road, Richmond, BC
V7A 4Z3, Canada, Telephone: (604) 277-1511, Telex: 04-355865

Mobile Data International (MDI) Inc. designs, manufactures and markets wireless data communication systems. Products include a variety of vehicular and portable communications terminals for two-way transmission of high integrity data at high speed over radio frequency. Wireless data communication systems for police departments, taxi companies, public utilities, hospitals, automobile associations, ambulance and fire brigades are supplied to customers in the United States, Western Europe and Asia. MDI also supplies transmission products to network operators who wish to offer public wireless data communications to smaller user groups.

Since its formation in 1978, MDI has experienced rapid growth in sales and product diversification, and has major system installations in North America, Europe and the Pacific Rim.

▲
MDI's Model 9031 Mobile Data Terminal. For use in police and public safety organizations, couriers, and gas and electric ultilities.

MOTOROLA CANADA LTD.
COMMUNICATIONS DIVISION

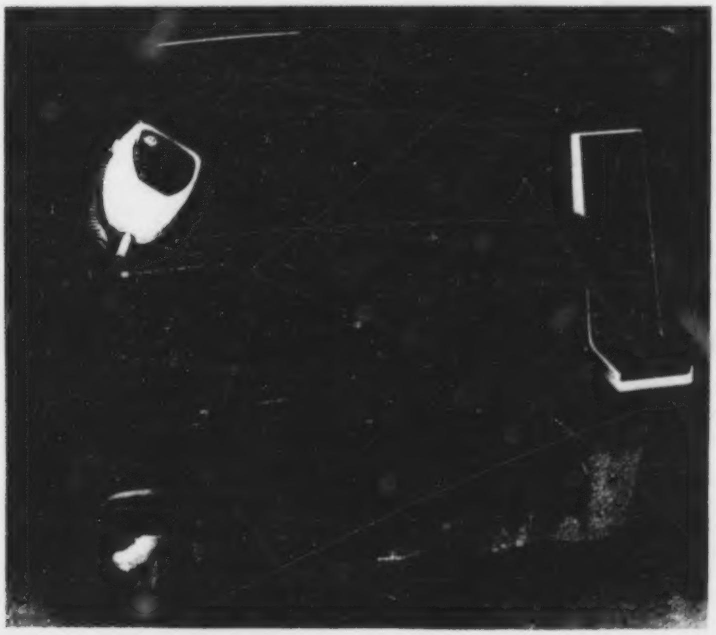
3125 Steeles Avenue, North York, ON M2H 2H6, Canada
Telephone: (416) 499-1441, Telex: 065-25191

The Communications division of Motorola Canada Ltd. designs and manufactures land mobile radio communications equipment and systems. Products range from traditional two-way mobile and hand-held portable radios, to state-of-the-art synthesized multi-frequency equipment capable of operating over widely separated frequencies.

Typical products offered by Motorola Canada include vehicular mobile radio, hand-held portable radio, base stations and repeaters, VHF/UHF multi-channel point-to-point radio, communications control centres, vehicular and hand-held wireless data systems, communications digital switches, digital voice encryption radio and telephones, microwave radio relay up to 23 GHz, railroad communications products, and radio alarm systems.

Products are designed for all land mobile frequency bands from HF to 960 MHz, and microwave radio relay equipment is available from 1.7 GHz up to 23 GHz. For very low capacity requirements, Motorola also offers a unique line of point-to-point products in the 150 MHz and 406-470 MHz bands.

The company will custom design a radio communications system to fulfill any user's operational requirements. Motorola Canada has designed and supplied large systems to not only all the major public safety services, railroads and other communications users in Canada, but has also supplied extensive systems in Australia, India, the Caribbean, many countries of Africa and in the Middle East. Motorola Canada's products are available through a worldwide network of Motorola representatives and agents in over 50 countries, who also provide ongoing support and maintenance.



◀
MOTOROLA MCX-100 FM two way 32 channel mobile radio features a solid state broadband synthesizer and voltage-controlled oscillator.

▶
MOTOROLA Information Systems' manufacturing facility in Brampton, Ontario.

MOTOROLA INFORMATION SYSTEMS LTD.

9445 Airport Road, Brampton, ON L6S 4J3, Canada
Telephone: (416) 793-5700, Telex: 06-97565, Twx: 610-492-5308

EXPORT SPECIALTY: Motorola Information Systems Ltd. (MISL) designs and manufactures data communications products to international standards which can be applied to a wide range of requirements. Its product portfolio includes: high-speed modems with data rates ranging from 9,600 bps to 19,200 bps; low- to medium-sized (4 to 64 channels) synchronous and asynchronous statistical multiplexers supporting up to 16 protocols including SDLC; a variety of line drivers (limited distance modems); and a recently-developed X.25 packet switched network processor.

INTERNATIONAL EXPERIENCE: Products are marketed worldwide through sister organizations in the US-based Motorola Information Systems Group (ISG), including subsidiaries and distributors worldwide. One of three ISG data communications production subsidiaries, MISL has supplied equipment for customers in more than 40 countries. Much of its export business comes from the highly-competitive European and Japanese markets. The company won the prestigious Canada Export Award in 1983.

COMPANY BACKGROUND: Motorola Information Systems Ltd. is part of Motorola ISG, which in turn is one of six groups within Motorola Inc. MISL was formed in 1984 from the amalgamation of ESE Ltd. and Four Phase Systems Ltd. MISL's charter in Canada is to be a single source supplier, offering total office automation solutions through combined expertise in distributed data processing and data communications.

MISL's roots date back to the formation of ESE in 1965. In 1978, ESE was acquired by Codex Corp., a subsidiary of Motorola Inc. In 1981, Motorola created the Datacomm organization, comprised of Codex, Universal Data Systems and ESE. Then in 1982, Motorola acquired Four Phase, merged it with the Datacomm Organization, and called the amalgam ISG.

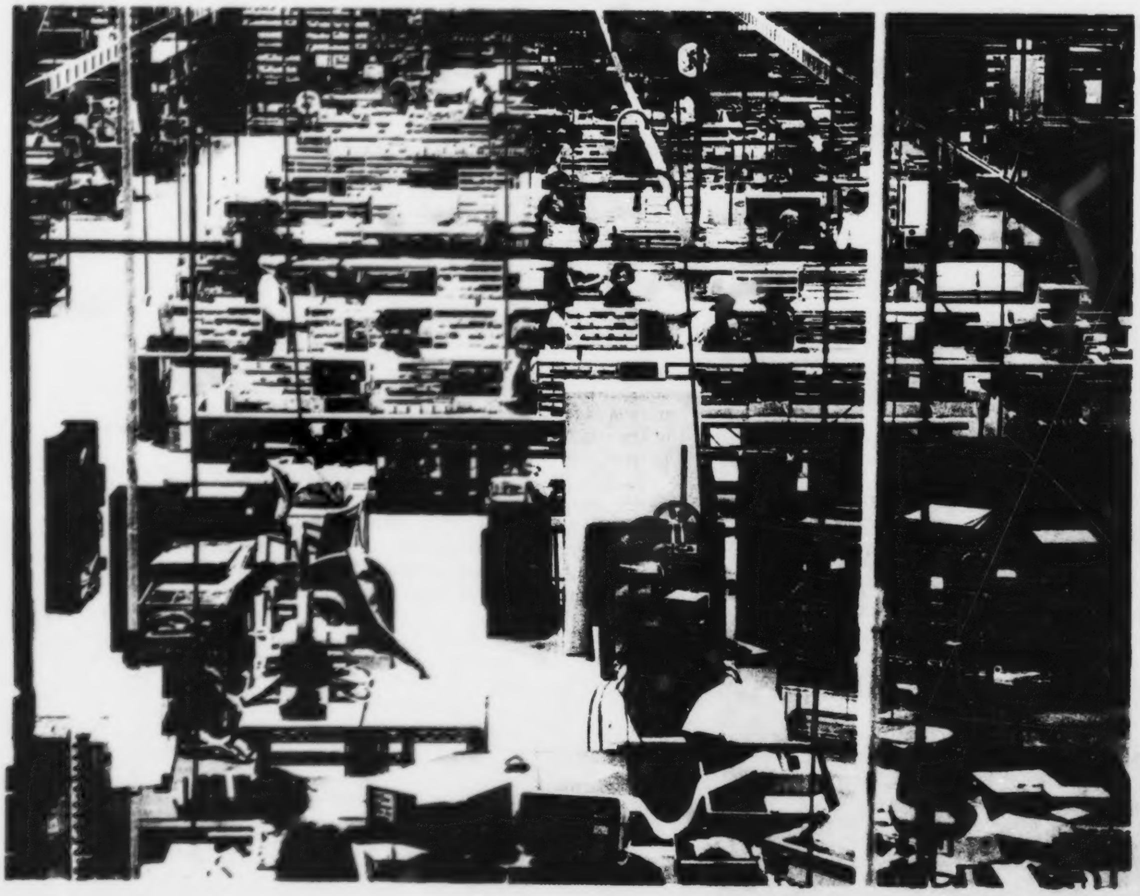
In addition to its data communications products for export markets, MISL also designs and produces a sophisticated signal processing computer for a variety of applications and a system for remote access and test of data circuits for carriers.

NAUTEL (NAUTICAL ELECTRONIC LABS LTD.)

R.R. #1, Tantallon, Halifax County, NS B0J 3J0, Canada
Telephone: (902) 823-2233, Telex: 019-22552

Nautel (Nautical Electronic Labs Ltd.) is a manufacturer of energy-efficient AM radio transmitters operating at power levels up to 50 kW. The transmitters are used for a variety of applications, including AM broadcasting in the 540-1700 kHz band at power levels ranging from 400 to 50,000 watts; non-directional beacons for civil aviation, at power levels from 50 W to 4 kW (16,000 W PEP); non-directional marine beacons for single or sequenced operation; and MF telegraph transmitters in the 415 and 540 kHz band with emissions A1A, A2A and F1B.

The company was established in 1969 and has production facilities in the US and Canada. It has supplied transmitters and related equipment to customers in more than 100 countries, including China, Australia, New Zealand and Singapore, and to the Indonesian Department of Air Communication.



▲
Designed in a single compact keyboard enclosure, NORPAK's VLSI-based videotex decoder terminal provides full NAPLPS/SRM level graphics at low cost.

▶ **OPPOSITE PAGE:**
NORTHERN TELECOM: Mikelis Svilans removes graphite crucibles from a furnace used for growing multi-layer semiconducting structures. The layers are later processed into lasers for fibre optics systems.

NELMA INFORMATION INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS

NEW MEDIA TECHNOLOGIES LTD.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS

NORPAK CORPORATION

10 Hearst Way, Kanata, ON K2L 2P4, Canada
Telephone: (613) 592-4164, Telex: EOS063666

Norpak Corporation is a manufacturer of videotex and teletext systems, and a leader in teletext technology. Utilizing low-cost VLSI terminal technology, the company designs and manufactures videotex and teletext products and systems which implement the EIA North American Basic Teletext Specification (NABTS) and ANSI North American Presentation Level Protocol Syntax (NAPLPS) standards. Norpak product range includes a full range of videotex and teletext database creation, delivery and terminal systems. The company also provides custom engineering development services, with supporting technical, creative production, training and consulting services.

Norpak's principal market is the US, where the company is the sole supplier of NABTS broadcast equipment. Norpak is also active throughout Europe and the Far East, where its equipment and standards have been widely adopted by Japan and Korea. The company has licensed manufacturing of videotex and teletext terminal equipment and software to US, Japanese and Korean concerns, and has licensed firms in the US and Korea for semiconductor manufacturing.

Norpak was founded in 1972, and was actively involved in the evolution of North American teletext and videotex technology. The company has supplied five generations of decoders, and three generations of creation and editing systems and teletext origination equipment.

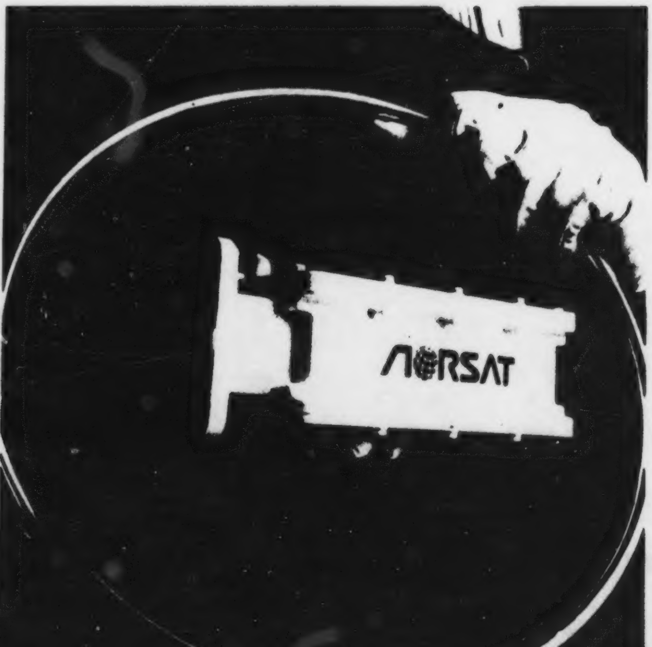
NORSAT INTERNATIONAL INC.

302-12886-78 Avenue, Surrey, BC V3W 8E7, Canada
Telephone: (604) 591-3334, Telex: 04-508306, Twx: 604-591-1514

Norsat International Inc. designs and manufactures satellite communications equipment and integrated packaged systems for TVRO, SMATV, CATV and data, operating in either C or Ku band. The company's product line includes satellite receivers, low noise amplifiers, low noise block down converters, and accessory products. The company also offers one-way and interactive private networks for data transmission applications. Norsat also offers custom design and manufacture of satellite systems to user requirements.

Established in 1978, Norsat is a pioneer in the development of TVRO satellite communications equipment, and offers complete TVRO systems. The company exports primarily to the US and is about to enter the UK market. Norsat has manufacturing and distribution agreements with Japan Radio Company.

▼
The NORSAT LNB provides unrestricted channel choice off multiple receivers.



NORTHERN TELECOM LTD.

33 City Centre Drive, Mississauga, ON L5B 3A2, Canada
Telephone: (416) 275-0960, Telex: 06-960348

EXPORT SPECIALTY: Northern Telecom Limited is the world's largest supplier of fully digital telecommunications systems and a leading supplier of information management systems for the office. As a total network supplier of telephony and data processing equipment, the company draws on over 100 years of experience in the telephony manufacturing business.

The corporation produces a wide range of equipment for telephone companies, private corporations, educational institutions, governments, hospitals, offices and residences.

It has a complete range of equipment and services in its portfolio for public and private communications networks. These include terminals, cable, outside plant, business communications and networks, central office switching, transmission systems and equipment, network support and test systems, spare parts and special products. System support services include technical training, technical assistance services, replacement and repair services, and support contracts.

Its success is founded upon its ability to create new technologies and products that meet emerging world market demands.

INTERNATIONAL EXPERIENCE: Northern Telecom spans the world with operating companies and sales offices. The four main operating companies are Northern Telecom Inc., the United States subsidiary; Northern Telecom Canada Ltd., which is responsible for Canadian, Caribbean and Latin American operations; Northern Telecom plc, England, which is responsible for operations in Europe, the Middle East, Africa and India; and Northern Telecom Pacific, Japan, which has four regions: Japan, South Pacific, Asia, and Far East.

These companies and sales offices are located in major centers around the world in order to be close to their clients. This promotes the understanding of local requirements and allows a high level of service.

The cornerstone of its approach to international marketing is flexibility. It employs a combination of marketing methods: direct sales in some 60 countries; wholly-owned subsidiaries in key markets to manufacture systems for both domestic sale and export; technology licensing and transfer for local application and production; joint ventures involving equity participation; and distribution agreements.

The world's telecommunications industry views North America as the major market of opportunity. Northern Telecom is the second largest designer and manufacturer of telecommunications equipment in this market. Its products are being increasingly marketed in the Middle East and virtually all West European countries.

One of its most noteworthy joint venture examples is in Turkey. Two decades ago, the Turkish Post, Telegraph and Telephone Administration chose the corporation as the supplier to revitalize its switching network. This led to the creation of a joint manufacturing venture called Netaş.

Netaş is now the largest telecommunications manufacturer in the Middle East. It has helped the Turkish PT&T add world-class fully digital telecommunications systems and components to its growing network. Thousands of jobs have been created in the joint venture, and many thousands more throughout the country because of its improved telecommunications service. Turkish interests are majority owners of the company.

In Japan, Northern Telecom became the first foreign telecommunications firm to meet the rigorous standards of the Nippon Telephone and Telegraph Corporation (NTT). It has been awarded a significant supply agreement to provide NTT with digital switching systems for the Japanese public telephone network.

Northern Telecom's selection by NTT was based on many competitive factors, especially its suitability and adaptability to support Japan's goal of a nationwide integrated services digital network (ISDN).

Marketing success is also being achieved by Northern Telecom in China, Korea, Singapore and other Pacific countries.

In the Americas, Northern Telecom is the largest telecommunications equipment supplier in Canada and the Caribbean, and second in the United States, the world's largest market.

The corporation's international success in some 90 nations is based on leading-edge technology, and a commitment to service. That includes adapting technology to meet specific local safety and technical

Continues on next page

requirements, delivering the product on schedule and providing ongoing support and customer service. Those elements will continue to play key roles in the company's future.

COMPANY BACKGROUND: Northern Telecom is a public company. Bell Canada Enterprises owns 51.9 percent of the shares, and the remainder is owned by more than 14,500 registered shareholders.

One of Northern Telecom's greatest strengths is that it is a member of a three-part corporate family, the other members being Bell Canada and Bell-Northern Research (BNR).

Bell is Canada's largest telecommunications carrier, and BNR, an internationally recognized centre of excellence, is Canada's largest private research and development establishment. BNR, which has a subsidiary in the United States and a laboratory in England, is owned 70 percent by Northern Telecom and 30 percent by Bell Canada.

The advantage of this tri-corporate relationship is that while Northern Telecom markets on a global basis, it can still draw from the strong historical operating base of Bell Canada and then drive BNR towards innovative design solutions to real world problems.

A fourth company, wholly-owned Northern Telecom Electronics, is the in-house supplier of large-scale integrated silicon components used in all of Northern Telecom's digital systems. This capability allows Northern Telecom to introduce new technology quickly without waiting for commercially produced devices.

A decade ago, Northern Telecom became the first telecommunications manufacturer to commit itself to designing and developing a complete line of fully digital switching and transmission products capable of interworking with each other.

That commitment, known as the Digital World, galvanized the global telecommunications industry. Digital technology is now the accepted standard on which telecommunications is based.

The global industry was stirred again when Northern Telecom announced the OPEN World. This vision of an Information Age future sees voice and data integrated through digital switching and routed along the twisted pair wiring which already links every desk in the modern office.

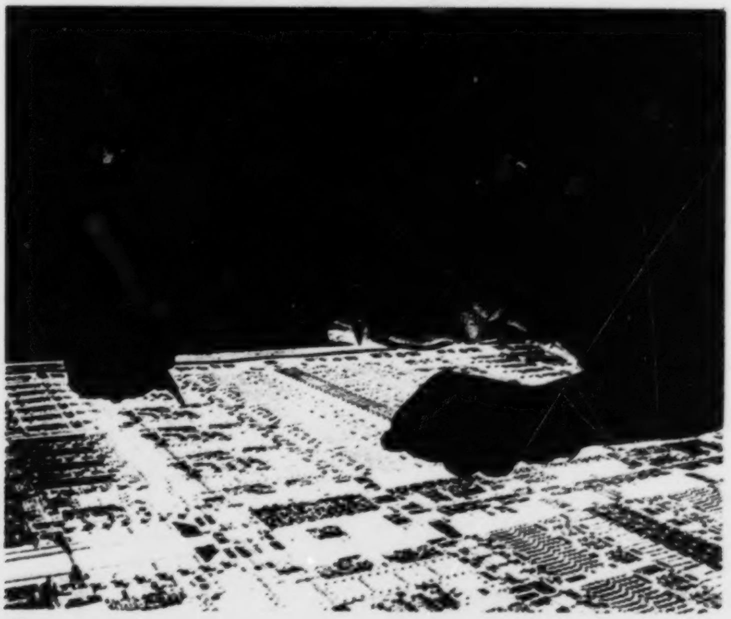
OPEN World established a planning framework and guidelines offering continuity of design, compatibility of diverse equipment from different manufacturers, congeniality and ease of use, control by users of their own network, and cost-effective solutions. OPEN stands for Open Protocol Enhanced Networks.

Recently Northern Telecom took a further step towards its vision of the Intelligent Universe, when it announced plans for product evolution based on a Dynamic Network Architecture. This framework of planning guidelines and specifications will raise networking to a new level of sophistication and performance. Carriers will be provided the opportunity to generate new revenue streams and offer competitive business services to their customers.

The Dynamic Network Architecture concept is making possible for Northern Telecom, its customers and their subscribers, the realization of a fully digital global telecommunications network—the Integrated Services Digital Network (ISDN). ISDN is a set of proposed standards for establishing compatability between the telephone network and the connection of various new data terminals and access devices.

Northern Telecom is the front runner in fulfilling the ISDN promise. The company will provide a digital "pipeline" for near-instantaneous communication by customers around the world. They will be able to transmit voice, data and images with more speed, quality, flexibility, ease of use and economy than they can today.

The ultimate goal of Northern Telecom's vision is the Intelligent Universe. It will be a future when people everywhere will be able to exchange, process, organize, store and access information through intelligent terminals linked by digital communications networks.



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NORTHERN TELECOM's DMS-100 Family switches are evolving to offer new capabilities and services for public telecommunications networks. Tony Cannataro checks the print-out results of a test of DMS line circuits at the corporation's Bramalea, Ontario facility.

▶

NORTHERN TELECOM: Bruce McCracken inspects the design for a new VLSI at a Bell-Northern Research laboratory near Ottawa.

NOVATEL COMMUNICATIONS

Western Canadian Place, 700-Ninth Avenue South West, Calgary, AB
T2P 3V4, Canada, Telephone: (403) 298-0444, Telex: 03-821264

EXPORT SPECIALTY: NovAtel Communications Ltd. designs and manufactures a complete line of cellular mobile radiotelephones and systems. It offers three families of radio telephones: 400 MHz units operating under a proprietary protocol known as Aurora; 800 MHz terminals complying with the IEEE-1S3-C protocol; and total access communications systems (TACS) protocol 900 MHz cellular phones. These products are available in mobile, transportable or fixed configurations.

On the systems side of cellular radio, NovAtel's expertise includes: design, integration and software development (call processing, database, maintenance and mobile protocol) for the switching and control portions; and the manufacture of base station cell site RF equipment. Its Aurora systems can operate either independently at 400 MHz or 800 MHz or simultaneously in both frequency ranges. For turnkey projects, NovAtel services range from RF design and computer modelling of RF propagation to traffic management studies and final installation and test.

INTERNATIONAL EXPERIENCE: NovAtel's radiotelephones are finding customers worldwide. A major achievement in 1984 was the signing of a licensing agreement with Hyundai Electronics of Korea to manufacture and distribute NovAtel cellular radio terminals in Korea. NovAtel serves the US market through its subsidiary, NovAtel Carcom Inc. In Europe, NovAtel has a distribution accord with Carphone Co. of England. The company has also received several major orders from LM Ericsson of Sweden.

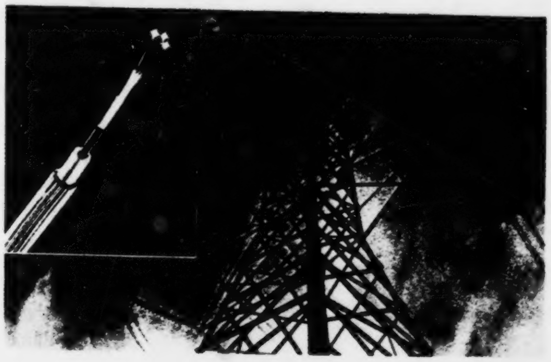
In 1986, NovAtel recorded a significant milestone with its first international system sale to the People's Republic of China. The simultaneous 400/800MHz system will provide cellular mobile radiotelephone service in the city of Chongqing.

COMPANY BACKGROUND: NovAtel was formed by Alberta Government Telephones (AGT) and NOVA, an Alberta Corp., in 1982. AGT is the telecommunications common carrier in the Canadian province of Alberta. NOVA is a major energy company.

The company was born out of the acquisition and reorganization of Westech Systems and International Systcoms, both well-established Canadian firms in their respective fields of mobile systems and related equipment. While NovAtel also manufactures and markets improved mobile telephone systems and terminals, it is the only Canadian company fully dedicated to cellular telephone technology.

NovAtel expects to supply a significant portion of the world cellular telephone market in 1986, with plans to sell some 150,000 mobile telephones. To serve its market, NovAtel has accelerated product research and development activities dramatically and has released several new products.

At home, NovAtel has been contracted by AGT to install a fully operational 800 MHz system in Alberta's largest city, Calgary, by mid 1986. Its first 400/800MHz system was delivered to a regional operating telephone company, Northwestel Inc., in late 1985.

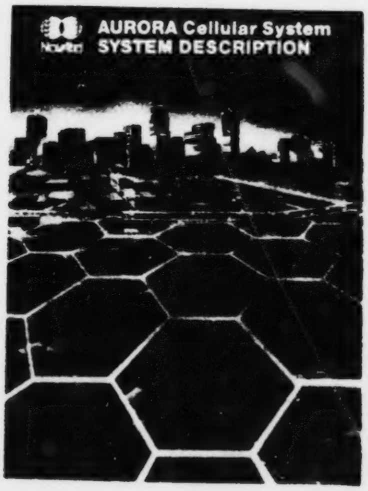


PHILLIPS CABLES LTD.

100 Consilium Place, Suite 300, Scarborough, ON M1H 3E3, Canada
Telephone: (416) 296-0250, Telex: 00636512

Phillips Cables Limited is a major Canadian manufacturer of electrical and communications cables. The company designs, engineers, manufactures and markets through three divisions: Power Products, Construction Products, and Communication Products. Phillips' products include high voltage power supply cables, underground distribution cables, building wire, armoured cables, portable power cables, down well pump cables, marine and shipboard cables, central office and network telephone cables, fibre optic cables and composite fibre optic/power cables for the power grid.

Phillips Cables, founded in 1889, was the first wire and cable plant in Canada. The company has six plants in Canada, and regional sales offices across Canada and in the US. Phillips Cables products are sold in Canada, the US and offshore through electrical distributors as well as directly to utilities and original equipment manufacturers.



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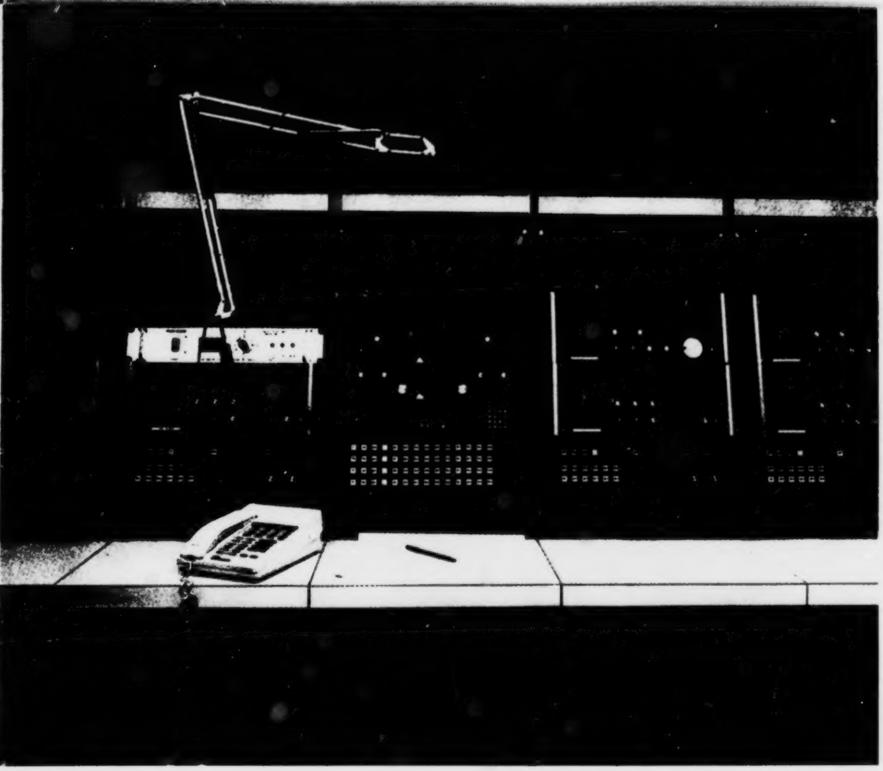
PHILLIPS FIBRAL* composite overhead conductor incorporates an optical communication cable. The optical cable is located in an aluminum tube in the centre of the conductor. Around this tube the required number of steel or aluminum alloy wires are stranded. FIBRAL conductor fully performs all the duties of an overhead groundwire and at the same time it provides a communication link having an extremely large data transmitting capacity.

◀

NOVATEL: The Aurora cellular system which can accommodate both fixed and mobile subscribers in 400 MHz and 800 MHz frequency bands.

◀ **FAR LEFT:**

NOVATEL GCH-152 BT handset for use on the North American (800 MHz) and British (900 MHz) cellular system.



PIRELLI CABLES INC.

1981 McGill College Avenue, Suite 1040, Montreal, PQ H3A 2X6, Canada
Telephone: (514) 282-1540, Telex: 055-61392

Pirelli Cables Inc. ranks as one of Canada's leading cable manufacturers, offering a full line of optical fibre and copper communications cables for telecommunications and data applications, as well as power cable and building wire. Pirelli products are designed to operate at the highest transmission speeds, with the longest repeater spacing for long-haul telecommunication systems. The company has customized its products for specific applications, including direct burial, aerial, conduit and plenum installations.

The company was established in 1953 as the Canadian affiliate of Pirelli Societe Generale of Switzerland. Pirelli has four manufacturing facilities in Canada, including its Communications Division which produces state-of-the-art fibre optic cable. The company is frequently involved in projects with major corporations in Canada and abroad, and has had significant exports to the US.

POLESTAR COMMUNICATIONS LTD.

P.O. Box 2280, Highway #2, Morinville, AB T0G 1P0, Canada
Telephone: (403) 939-6577, Telex: 037-42509

Polestar Communications Ltd. provides products, system design and signal propogation analysis for HF-SSB radio. Polestar uses IONCAP, a computer program which allows systematic design of an entire HF radio system. Products manufactured by the company include the ATR-7 SELCAL, an ICAO-compatible SELCAL which provides selective calling capability over HF radio links, and the ATR-10 Communications Console which provides interconnect between HF/UHF/VHF radio systems and external devices such as telephone, Telex and facsimile. In addition, Polestar has developed a microprocessor-controlled version of the ATR-10 which will handle up to 32 simultaneous full duplex conversations.

Founded in 1980, Polestar initially developed long-range communications for offshore drilling rigs. With stations across Canada HF-SSB coverage for fixed, aeronautical and marine transmissions extends from Central America to the high Arctic, and from mid-Pacific to Europe.

Polestar Communications has been a leader in the development of high speed data transmission over HF radio links. The company has fulfilled contracts in Holland and the US, and expects new business in Indonesia, Jakarta, Singapore and Australia.

POSITRON INDUSTRIES INC.

4810 Jean Talon West, Montreal, PQ H4P 2N5, Canada
Telephone: (514) 731-3715, Telex: 05-825739

Positron Industries Inc. designs, develops and manufactures state-of-the-art telecommunications systems, including trading turrets; answering positions; mobile radio and telephone/radio control consoles; alarm reporting, remote control and telemetry systems; 911 emergency call enhancement systems; and power station wire-line communications protection systems. The company also has full custom design capability.

Positron provides full design, development, production, testing and quality control services. Since its founding in 1970, the company has developed over 200 products, and is winner of two Institute of Electrical and Electronics Engineers product awards. Customers include most of the major telephone and power utilities in Canada and the US, plus government and industry. In addition to the US, Positron has exported to Europe, the Middle East and Australia.

◀ LEFT:
Shown is Control Central for POLESTAR COMMUNICATIONS LTD. new facility located at Morinville, near Edmonton, Alberta. Operators here control the local Cardiff radio system as well as monitoring and when necessary, operating Rainbow Radio in Dartmouth, N.S. and the station in St. John's, Nfld.

◀
POSITRON SYSTEM 304—programmable, totally software-controlled, skinny wire electronic traders' turret, offering software line assignability (including hoot'n'holler lines), M.I.S., remote diagnostics, 3-pair cable for up to 240 lines per position, many other features.

▶
PYLON Data Testing Systems produced for Alberta Governement Telephones.

PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.

147 Colonnade Road, Nepean, ON K2E 7L9, Canada
Telephone: (613) 226-7920, Telex: 053-4961

Pylon Electronic Development Company Ltd. is a supplier to most Canadian utilities and many government agencies. Pylon products are exported through large OEMs and directly through 13 representatives in ten countries. The company was incorporated in 1985.

Pylon telephone and telecommunications products include power converters and inverters for central office plants, uninterruptible power plants, rectifiers, ringing generators, PABX supplies and some data equipment. The instrument division manufactures time code generators, digital read out equipment, EMI hardened displays and nuclear test or calibration equipment. The company also produces cables, harnesses and custom test apparatus.

QUALITY COMMUNICATION PRODUCTS (1979) LTD.

P.O. Box 1328, 239 Mountain Street, Morden, MB R0G 1J0, Canada
Telephone: (204) 822-4431, Telex: 07-55205

Quality Communication Products manufactures telephone loading coils and cable build-out networks, precision toroid coils, close tolerance wire-wound resistors and mylar film capacitors, voice frequency networks and wiring harnesses.

The company was established in 1964 and has exported its products to Iran, Costa Rica, Puerto Rico and New Zealand.

RELIANCE TELECOMMUNICATION PRODUCTS

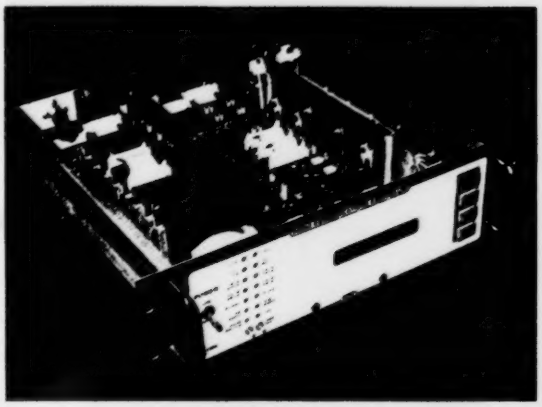
Div. of Reliance Electric Limited

122 Edward Street, St. Thomas, ON N5P 1Z2, Canada
Telephone: (519) 631-0780, Telex: 064-73521, Twx: 610-356-6703

Reliance Telecommunication Products is the Canadian manufacturer of Lorain power equipment for the telecommunications industry, including battery chargers, rectifiers, power supplies and dc distribution systems, UPS/inverter systems, single-phase up to 10 kVA, and power conversion equipment.

Reliance also manufactures Reliable/Utility products including outside plant, subscriber premise and central office protection and termination equipment. The company distributes transmission, testing and terminal equipment manufactured by R-Tec Systems.

The company is a division of Reliance Electric Company, and is a wholly-owned subsidiary of Exxon Corporation. Although most foreign sales are handled by its US-based parent's international group, Reliance has exported directly to Saudi Arabia and can respond to any international inquiry.



RMS INDUSTRIAL CONTROLS INC.

1100 Lansdowne Street, Port Coquitlam, BC V3B 5E2, Canada
Telephone: (604) 464-2315, Telex: 04-353612

RMS Industrial Controls Inc.'s primary business is radio data communications, supplying products such as radio remote control systems, RF data modems, RF network controllers, UHF mobile radios and custom engineered RF communication networks for a variety of applications.

A recent product innovation is a radio data modem designed with a UHF digital synthesized radio and a microprocessor controlled 1200 bps modem. Other features such as forward error correction, gateway control and multi-access control schemes can also be included as options. This product is ideally suited for applications such as fixed point-to-point data communication.

RMS began operations in 1976. The company originally supplied radio remote control systems and RF communications for industrial applications and offshore oil exploration, and rapidly developed a broad family of electronic and RF modules. The company sells to both end-users and OEMs, and has a network of international agents.

▲
This radio communications controller from RMS Industrial Controls Inc is suited to multi-channel dispatch systems, particularly, light rapid and urban bus transit, police, fire, ambulance and courier systems. This product can be configured into a system which has a single master, multiple base stations and multiple (remotes) mobiles.

ROCKWELL INTERNATIONAL OF CANADA LTD.

Wescom Canada Division

45 Sinclair Avenue, Georgetown, ON L7G 4X4, Canada
Telephone: (416) 877-0191, Telex: 06-97777, Twx: 610-492-2646

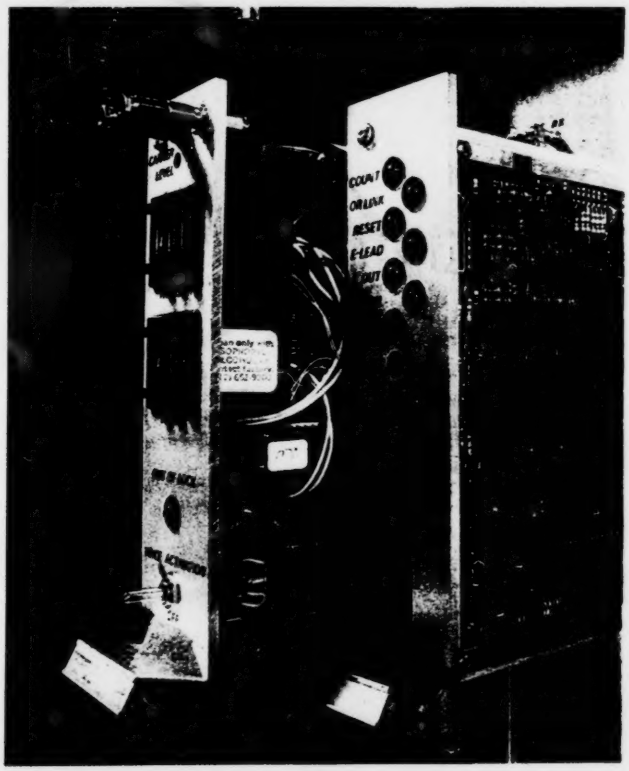
Wescom Canada is a designer and manufacturer of communication and transmission equipment, primarily for "special services" applications. Its offerings include: voice frequency interchange and subscriber conditioning equipment; loop conditioning microprocessor-controlled interface products for radio pager systems; pulse code modulation multiplexing (PCM) equipment; and an audio teleconferencing system. The firm is presently developing a digital fault locate system for monitoring PCM repeaters and plans to expand its activities into fibre optics transmission equipment production.

Wescom Canada is a subsidiary of the Wescom Telephone Products division of Rockwell Telecommunications Inc. of the US. The company was originally established in 1965 as the Canadian distribution arm of Wescom. The Canadian operation began designing and producing its own products in 1979.

SED SYSTEMS INC.

P.O. Box 1464, 2174 Airport Drive, Saskatoon, SK S7K 3P7, Canada
Telephone: (306) 244-2393, Telex: 074-2771, Twx: 610-731-1476

SED Systems Inc. is an advanced technology engineering company specializing in state-of-the-art two-way satellite telecommunications systems and satellite receivers. The company provides systems and software design for communications, aerospace, defence and space sciences. SED designs and manufactures two-way, voice-data satellite communications systems for Ku or C band; satellite TV receivers; microwave componentry; satellite earth stations, control centres, and test equipment; rocket payloads, space science instruments for upper atmospheric research; meteorological systems; and radar displays.



The company was created in 1965 as the Space Engineering Division (SED) of the University of Saskatchewan, to design and build rocket instrumentation for the National Research Council of Canada. After it was incorporated as a private company in 1972, it began the process of developing a line of commercial products based on aerospace technology.

SED has undertaken a number of international projects, principally in the U.S. and Brazil. The company designed and built the complete ground control station for the two Brazilian telecommunications satellites in conjunction with Spar Aerospace, and is a major supplier of satellite earth stations to Telesat Canada.

SINCLAIR RADIO LABORATORIES LTD.

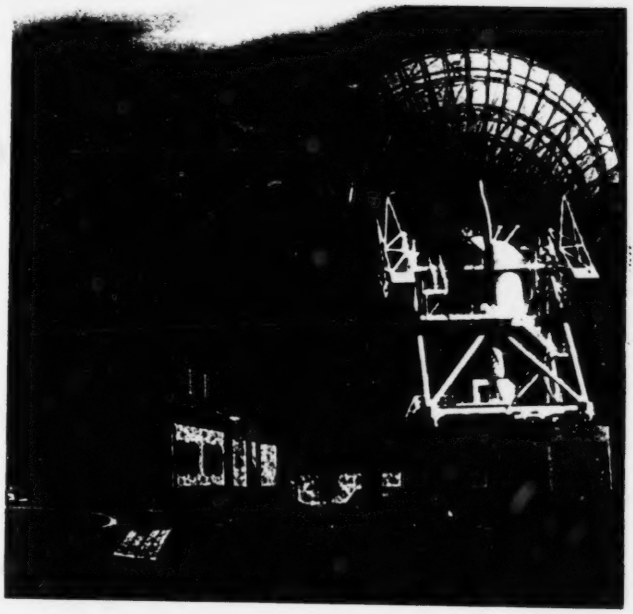
85 Mary Street, Aurora, ON L4G 3G9, Canada
Telephone: (416) 727-0165, Telex: 06-218789

Sinclair Radio Laboratories specializes in the design, development and manufacture of support equipment primarily for UHF and VHF two-way radio and telephone systems. The company's product line includes antennas for all frequencies; low intermod antennas specifically for multicoupling; filters and filter systems particularly for multicoupling with low intermod, bandpass, low and high pass band stop; active receiver multicouplers; autotuned filters and antenna couplers; transmitter combiners; isolators; circulators; diplexers/duplexers; Comshel communications shelters; and clamps and mounting hardware. Sinclair also offers consulting services on all antenna and filter systems, and measurement services for intermod products, filter characteristics, antenna patterns and impedances.

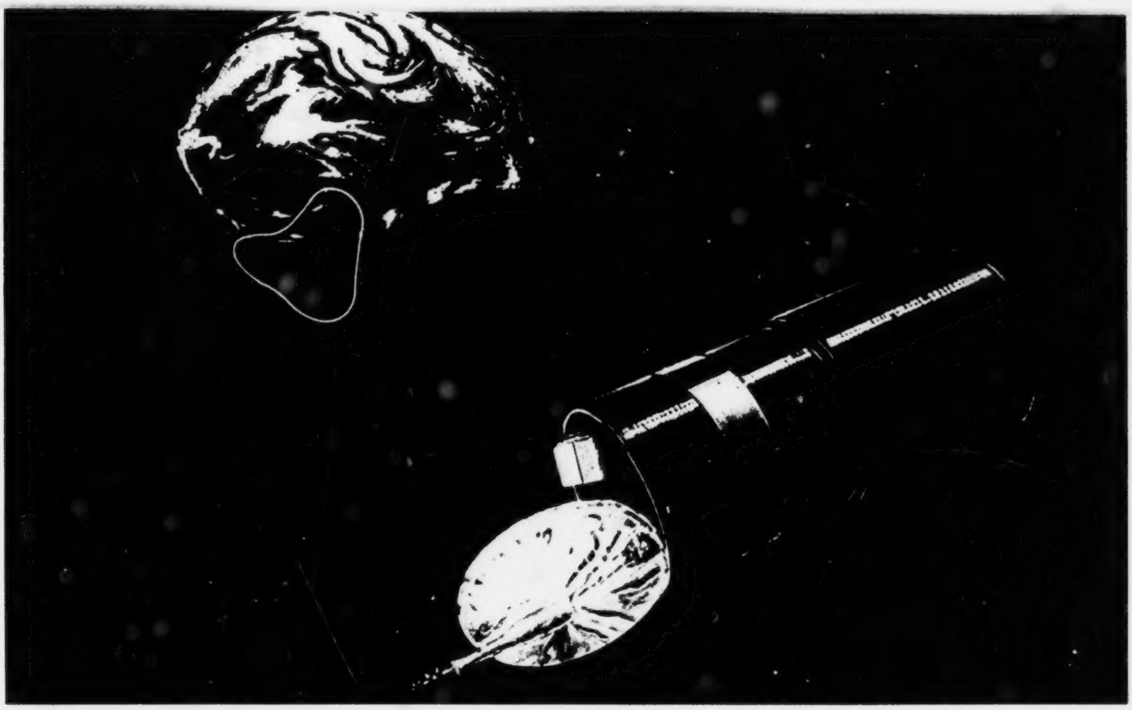
Sinclair products can be found in telecommunications systems worldwide. The company has representatives in the UK, Singapore and Australia, and a wholly-owned subsidiary in the US.

Incorporated in 1951, Sinclair Radio Laboratories has strong engineering expertise, particularly for hard to suit applications.

◀
SED's SKYSWITCH(tm) is a two-way, voice/data satellite communications system for private networks.



▶
Weir Earth Station, Quebec, manufactured by SPAR AEROSPACE.



SPAR AEROSPACE LIMITED

21025 Trans-Canada Highway, Ste-Anne de Bellevue, PQ H9X 3R2,
Canada, Telephone: (514) 457-2150, Telex: 05-822792

Spar Aerospace Limited is engaged in the design, development, manufacture and servicing of systems and products for space, defence, communications, aviation and teleoperator markets. The company is the principal supplier in Canada and a major international manufacturer of satellites and satellite subsystems for communications and surveillance applications. It also supplies ground terminals for domestic and international communications systems.

SPACE ELECTRONICS: Spar and its predecessor companies have contributed to the design and manufacture of 50 satellites and subsystems. In addition to building highly successful scientific satellites for Canada's space research program, the company assumed increasingly greater participation in a number of domestic and international telecommunications satellite programs until it was entrusted with the prime contractor responsibility for Telesat Canada's Anik D series. Spar completed the $78.6 million contract for two 24-channel satellites in 1984.

A complete turnkey system that included a similar pair of satellites and a related ground control system (TT&C) were built for EMBRATEL, the Brazilian government-owned telecommunications company, under a $125 million (US) order signed in 1982. The project, known as Sistema Brasiliero de Telecomunicacoes por Satelite (SBTS) was completed in 1985 with the successful launch of the second spacecraft, and constitutes the first domestic communications satellite system in Latin America.

Spar has a number of on-going space technology contracts including the development, integration and testing of the solar array for the European Space Agency's Olympus satellite; the supply of subsystems to Hughes Aircraft Company for five Intelsat VI satellites; and is waiting approval of the construction phase for Canada's mobile communications satellite.

Canada has been deeply involved in the US Space Shuttle program with the supply of the Remote Manipulator System (RMS) used to deploy and retrieve payloads. The RMS is a highly sophisticated, computer-controlled, 15 metre long mechanical arm. The prototype Canadarm and an initial supply of three flight systems were designed and developed by Spar under an agreement between the National Research Council of Canada and the National Aeronautics and Space Administration.

EARTH STATIONS: Spar has worked on more than 230 projects worldwide for satellite earth stations, subsystems and components. In 1984, the company signed contracts valued at more than $28 million to provide satellite earth stations and technology transfer to the People's Republic of China. Another major export sale was a shared $3.5 million contract with Ericsson Telephone Corporation Far East of Thailand to supply the Royal Thai Navy and the Telecommunication Authority of Thailand with satellite earth station equipment.

Spar has the capability to build any class of Intelsat earth station, and has installed Class A and Class B stations in 15 countries. The company has been the sole earth station supplier to Canada's international telecommunications carrier, Teleglobe Canada, upgraded its system with Time Division Multiple Access/Digital Speech Interpolation (TDMA/DSI) equipment in 1985. Spar developed the TDMA system operating at the Intelsat standard of 120 Mbps specifically for Teleglobe.

Spar's US subsidiary, Comtel, designs and makes light- and medium-route (3-15 Mbps and 15-60 Mbps) TDMA systems, satellite network control centres and bulk encryption equipment. Comtel sells direct in the US, and through Spar's Communications Systems Division for world markets. The company has supplied a 60 Mbps system to Indonesia, valued at $3 million, and an experimental 15 Mbps system for the Telecom Research Centre in India. US customers include NASA, Western Union and Dow Jones and Co. Inc.

A line of low-cost FM single-channel per carrier (SCPC) earth stations has been developed for telephony and data applications. Named SPARCOM, the stations can be equipped with up to 12 circuits, and are well suited for remote locations and private networks. Spar has developed a specialized terminal to bring reliable telecommunications to offshore drilling rigs. Mounted on a computer-controlled motion compensation platform, the

◀ **OPPOSITE PAGE:**
The Brazilsat communications satellite on station 36,000 km above the Equator with an artist's impression of the "footprint" for telephone and television signals.

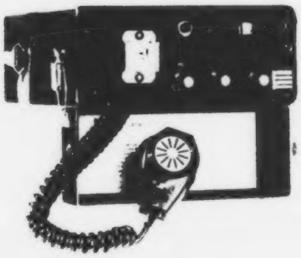
◀
The SPAR-built Anik D2 in the cargo bay of the shuttle and the Canadarm in its cradle prior to the rescue of two wayward satellites by mission STS 51A.

SPARMARINE terminal has been proven in the Atlantic Ocean.

To meet the emerging demand for even smaller commercial earth terminals, Spar has developed SPARSAT. Equipped with an optimally designed 1.5 m antenna reflector, it performs as well as most 2.5 m versions. The unique reflector was designed by the Satellite and Aerospace Systems Division of Spar, and is matched with Demand Assignment Multiple Access (DAMA) electronics and a variable bit rate modem developed by the Communications Systems Division.

COMPANY BACKGROUND: The Special Products and Applied Research (SPAR) Division was separated from deHavilland Aircraft of Canada and established as an independent enterprise in 1968. Spar employs more than 2,000 people and has absorbed a number of firms to supplement its internal resources. Key acquisitions with respect to the space and communications activities include Astro Research Corporation of California (renamed Astro Aerospace Corporation in 1984), the assets of the Government and Commercial Systems Division of RCA Limited and certain assets of the space electronics manufacturing unit of Northern Telecom Ltd., and Commercial Telecommunications Corporation (Comtel).

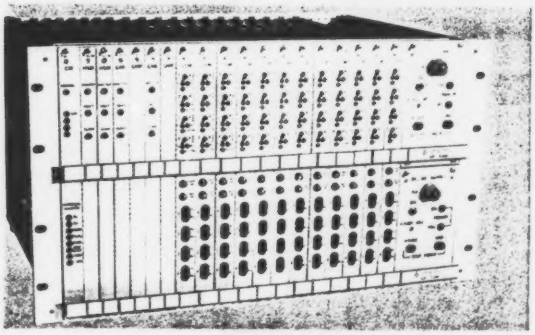
▼
This low-cost satellite earth station, SPARSAT (small apeture terminal) features a high performance 1.5 m reflector which behaves similar to 2.5 m designs. Made by SPAR AEROSPACE Limited, the terminal can be configured in either MESH or STAR networks.

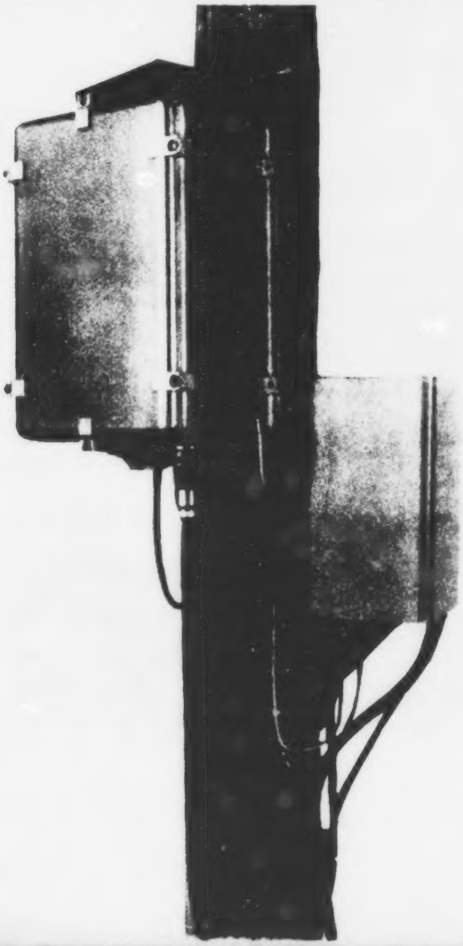


▲
SPILSBURY COMMUNICATIONS: Portable SSB Transceiver, model SBX-11A radiotelephone.

▼ BELOW:
SPERRY model SP-TDM-3 multiplexer for both telex and non-telex applications on to a high speed interface for connection to a modem.

▼ BOTTOM:
SR TELECOM sealed weatherproof outstation cabinet (left) with power and junction pedestal (right) serving 6 subscriber lines per outstation.





SPERRY INC.

AEROSPACE AND MARINE GROUP

Highway 17, P.O. Box 1300, Rockland, ON K0A 3A0, Canada
Telephone: (613) 446-6011, Telex: 053-4806

Sperry Inc., Aerospace and Marine Group, designs and manufactures data transmission equipment, multiplexers, message generators, distortion analyzers, computer interface (Telex), communication control and switching systems (air traffic and marine) and relevant computer-assisted training simulators. The company also offers research and development capabilities and complete turnkey project capabilities.

The company has been designing and developing, as well as manufacturing, telecommunications equipment in Canada since 1951, and has been exporting to the international market for over ten years. The Canadian operation also provides logistic support, modifications, and repair and overhaul of all types of avionics and marine systems. The Sperry facilities are approved under the Canadian National Defence quality assurance, and develops and produces products and systems for both military and commercial applications.

SPILSBURY COMMUNICATIONS LTD.

120 East Cordova Street, Vancouver, BC V6A 1L1, Canada
Telephone: (604) 684-4131, Telex: 04-55482, Cable: SPILTIN

Spilsbury Communications Ltd. specializes in the manufacture and turnkey supply of a wide range of communications equipment and systems including: single sideband HF radio systems for voice and/or data transmission in base, mobile and portable configurations; VHF/UHF mobiles, portables all with microprocessors for complex systems; full duplex mobile telephones for IMTS, AMTS, secode smart and other automatic formats; radio beacon systems, and self tuning efficient high frequency antennas; small alarm and supervisory control via radio; digitized voice systems and announcers for airline arrival/departure and other telephone answering applications requiring no mechanical drives; complete weather radio systems with digitized voice; and working police and fire command control centres.

Spilsbury has been actively designing and manufacturing radio communications equipment since 1941, and has been involved in servicing the international market for over three decades. Spilsbury has provided communications equipment to major government and industrial accounts in the US, the Middle East, Central America, Indonesia, China and Africa.

SR TELECOM INC.

8150 Trans Canada Highway, St. Laurent, PQ H4S 1M5, Canada
Telephone: (514) 335-1210, Telex: 05-824919

SR Telecom Inc. is a pioneer and world leading manufacturer of subscriber radio systems. Using advanced point-to-multipoint TDMA microwave technology operating in the 1.5, 1.8 and 2.4 GHz bands, the systems deliver urban-quality telephone service to rural and suburban areas.

Subscriber radio has been adopted by telephone companies worldwide to provide a fully transparent connection between the two-wire terminals on an exchange distribution frame and a remote standard telephone set. In many parts of the world, the cost of installing or upgrading cable facilities in underserved areas is prohibitive. Subscriber radio can be used, for example, to overcome a shortage of cable pairs in an area, with subscribers connected to the service by multi-party lines where a single subscriber line serves a group of subscribers.

The equipment is used to provide telephone and data service to rural or urban areas; and SCADA and telephone service for utilities, resource industries, offshore oil platforms and private networks. SR technology will extend existing telephone networks cost effectively, efficiently and without fear of obsolescence into sparsely populated areas where no service or utilities exist, with a measured MTBF of over 14 years.

SR systems are now in operation in 38 countries, servicing the needs of around 80 administrations and telephone companies.

TIE/COMMUNICATIONS CANADA, INC.

351 Steelcase Road West, #1, Markham, ON L3R 4H9, Canada
Telephone: (416) 475-5577, Telex: 06-966502

TIE/communications Canada, Inc. is a manufacturer and supplier of electronic key telephone products to the Canadian telecommunications market, with sales to both telephone and interconnect companies. The company also designs and manufactures hybrid telephone systems and PABX systems.

TIE Canada sells Mercury, a fully digital and electronic modular PABX, to offshore markets. The system, which oeprates with any 2-wire single line telephone, offers economical expansion to 1,920 extensions, voice and data transmission, high reliability and cost management capabilities, and has an extensive range of features, including networking software, a constant dialing program and full-feature telephones. Mercury was launched in the international marketplace in late 1984.

TIE/communications Canada, established in 1980, is a wholly-owned subsidiary of TIE/telecommunications Canada Ltd. US-based TIE/communications Inc. owns a controlling interest in TIE/telecommunications Canada Inc.

TIL SYSTEMS LIMITED

60 Yonge Street, Suite 1100, Toronto, ON M5E 1H5, Canada
Telephone: (416) 869-1157, Telex: 06-524114

TIL Systems Limited offers services primarily in three areas: the supply of terminal devices, turnkey or service systems, and network management of an automated terminal environment. The company builds the XPERT Terminal. This unit incorporates several terminal functions, and can transmit and receive inputs from as many as four separate sources at the same time, which can be linked directly to private or public packet switched data networks (X.25), while simultaneously connecting directly to a local host. The company also makes the XPERT PC Card, a plug-in card for personal computers, and XPERT PDX, an intelligent data communications processor that features high data throughput and efficiency, multiple protocol support and interface modules, load monitoring statistics, and symbolic descriptor capability for simplified communications, which acts as a controller for the X.25.

The company supplies messaging systems, which are part of a shared resource running on a mainframe, and a stock market historical data base, an international data base with close-over-close dynamic update. In network management, the company operates a control centre monitored constantly for managing systems and X.25 terminal devices worldwide, with remote electronic maintenance (REM) as the major diagnostic tool.

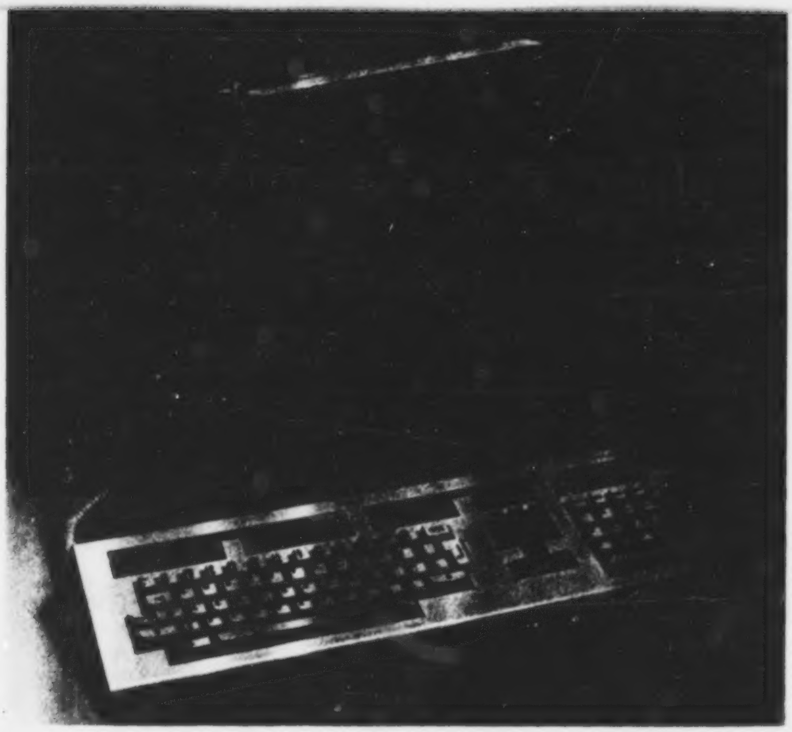
TIW SYSTEMS LTD.

4935 Kent Street, Niagara Falls, ON L2H 1J6, Canada
Telephone: (416) 356-2413, Telex: 061-5201

TIW Systems Ltd. is a multidisciplinary systems engineering and project management company with primary emphasis on the design, manufacture and implementation of satellite communications equipment and facilities. In addition to its large steerable antenna systems for telecommunications, radio astronomy and other scientific activity, the company has developed a full line of engineering and antenna system components, such as microwave feeds, servo control systems and tracking receivers. TIW also manufactures a line of AGC, fixed gain and variable gain RF amplifiers and a multipoint TDMA system designed for use in thin- to medium-density routes such as offmain trunk or private network systems.

Since its founding in 1976, TIW has gained extensive international business and project management experience. The company has antenna systems installed in the US, Australia, Spain, Norway, Sweden, Finland, Indonesia, Iceland, Cyprus, Ghana, Lebanon, Panama, Italy, the UK, Brazil, the Netherlands and Oman.

TIW's 32 meter beam wave guide antenna for use in Intelsat communications ground terminal.



◀
VOLKER-CRAIG LTD manufactures data display terminals that are compatible with a variety of different standards and other vendor's offerings. This VC5220 is fully compatible with Digital Equipment Corp's VT220, and includes both VT100 and VT52 compatibility.

TRENCH ELECTRIC

A Div. of Guthrie Canadian Investments Limited

71 Maybrook Drive, Scarborough, ON M1V 2L5, Canada
Telephone: (416) 298-8108, Telex: 06-963749, Cable: TRENLEC-TORONTO

Trench Electric has been designing and manufacturing tuned line traps and untuned line inductors for power line carrier communication systems since 1965. Carrier frequency technology for Power Line Carrier (PLC) applications has been in use since the early 1900s, providing a means of transmitting protective relaying, supervisory control signals and voice communication over transmission lines. The system uses a line trap, or inductor, in the power transmission line to provide a high impedance to carrier frequencies, while maintaining a negligible impedance to the power frequency current.

Trench Electric line traps and line inductors have rated continuous currents and rated short-time currents corresponding to the requirements of the International Electrotechnical Commission (IEC publication 353) and the American National Standards Institute (ANSI C93.3). Special computer-based designs are available upon request to meet other standards and customer's special requirements.

Installations have been sold in over 40 countries, in all continents.

TRILLIUM TELEPHONE SYSTEMS INC.

P.O. Box 13030, 603 March Road, Kanata, ON K2K 1X3, Canada
Telephone: (613) 592-2550, Telex: 053-4952

Trillium is a designer and manufacturer of fully-featured, low-cost small electronic telephone systems (up to 32 telephones and 10 exchange lines) for residential and small business use. Products include telephones for use with PBX and Centrex telephone switches and a range of key systems: one-exchange line, nine-telephone; two-line, eight-phone; three-line, eight-phone; six-line, sixteen-phone; ten-line, 32-phone systems.

Trillium was formed in 1983 as a wholly-owned subsidiary of Mitel Corporation. The company acquired the assets and technology of its parent's SX-2 telephone switching system and proceeded to expand the product line. Trillium has exported products to Scandinavian countries, Hong Kong and the Caribbean.

UNI-TEL LIMITED

1792 Birchmount Road, Scarborough, ON M1P 2H7, Canada
Telephone: (416) 291-3131 Telex: 06-963523

Uni-Tel Limited makes equipment and systems for supervisory control, remote control, fault alarm reporting, telemetering and data transmission. The company's customers include common carriers, telephone operating companies, pipelines, power generating and distributing utilities, municipal utilities, railroads, radio and television broadcasters, and industrial and manufacturing companies.

The company provides equipment and systems for complete microwave service channels; remote fault alarm reporting for microwave and central office applications; remote control; DUV (data-under-voice) control; voice orderwire; WLEL (wire line entrance link) control; and computer-based logging.

Uni-Tel has delivered service channel equipment to customers in the US, Mexico, India, Africa, Norway, Iran, Nicaragua, Venezuela and Pakistan. Major international projects include the supply of a heavy-route microwave system, consisting of 100 remote stations and 26 master stations, serving the entire Indian sub-continent, the West Pan-Africa Microwave System with 55 remote stations and 14 master stations, and a heavy-route national radio system in Mexico. Similar equipment is in use throughout Ecuador, Chile, Indonesia and Barbados.

VOLKER-CRAIG LTD.

330 Weber Street North, Waterloo, ON N2J 3H6, Canada
Telephone: (519) 884-9300

Volker-Craig Ltd. designs, manufactures and markets data display terminals. The company's products are used with minicomputers and mainframes, and as an add-on to microcomputers running multi-user software. Volker-Craig's products include: low-end "dumb" ASCII async terminals; smart, editing mid-range terminals; DEC VT100/220 compatible terminals; PC slave terminals; and Tektronix-compatible Graphix terminals.

The company was incorporated in 1973 and has offices in England and the US. The company's principal export markets are in the UK and the US. Volker-Craig sells internationally through distributors in other countries.

Product Reference List

ANTENNAS

- 2001 S.N.I. (SATELLITE NETWORK INC.)
- ANDREW ANTENNA COMPANY LIMITED
- CANADIAN LARSEN ELECTRONICS LTD.
- COM DEV LTD.
- LEBLANC & ROYLE TELECOM INC.
- LINDSAY SPECIALTY PRODUCTS LTD.
- NAUTEL (NAUTICAL ELECTRONIC LABS LTD.)
- SED SYSTEMS INC.
- SINCLAIR RADIO LABORATORIES LTD.
- SPAR AEROSPACE LIMITED
- SPILSBURY COMMUNICATIONS LTD.
- TIW SYSTEMS LTD.

BATTERIES

- GNB BATTERIES (CANADA) INC.

CABLE

- ALLIED AMPHENOL PRODUCTS
- ANDREW ANTENNA COMPANY LIMITED
- BOSTON INSULATED WIRE AND CABLE COMPANY LTD.
- CANADA WIRE AND CABLE LIMITED
- DEVELCON ELECTRONICS LTD.
- FOUNDATION INSTRUMENTS INC.
- LEBLANC & ROYLE TELECOM INC.
- NORTHERN TELECOM LTD.
- PHILLIPS CABLES LTD.
- PIRELLI CABLES INC.

COMMUNICATIONS

(Voice and Integrated Communications Systems)

Data

(see also DATA COMMUNICATIONS)

- AEG BAYLY INC.
- AMDAHL COMMUNICATIONS INC.
- BAND ELECTRONICS LTD.
- CALGARY CONTROLS LTD.
- ELECTROHOME LIMITED
- FOUNDATION INSTRUMENTS INC.
- GANDALF DATA LIMITED
- INTERCONTINENTAL DATA CONTROL CORP. LTD. (INTERDACO)
- LINCOM INTERNATIONAL COMMUNICATIONS
  - Div. of Fisher Technologies Inc.
- MICROTEL LIMITED
- MOBILE DATA INTERNATIONAL INC.
- NELMA INFORMATION INC.
- NORTHERN TELECOM LTD.
- POLESTAR COMMUNICATIONS LTD.
- ROCKWELL INTERNATIONAL OF CANADA LTD.
  - Wescom Canada Division
- SED SYSTEMS INC.
- SPAR AEROSPACE LIMITED
- SPERRY INC.
  - Aerospace and Marine Group
- UNI-TEL LIMITED

Fibre Optic Systems, Components

- AEG BAYLY INC.
- AMDAHL COMMUNICATIONS INC.
- C/D COMMUNICATION DEVICES INC.
- CANSTAR COMMUNICATIONS
- FOUNDATION INSTRUMENTS INC.
- HARRIS FARINON CANADA INC.
- NORTHERN TELECOM LTD.
- PHILLIPS CABLES LTD.
- PIRELLI CABLES INC.
- PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
- ROCKWELL INTERNATIONAL OF CANADA LTD.
  - Wescom Canada Division

Key Systems

- DBA COMMUNICATION SYSTEMS INC.
- HARRIS FARINON CANADA INC.
- NORTHERN TELECOM LTD.
- POSITRON INDUSTRIES INC.
- TIE/COMMUNICATIONS CANADA, INC.
- TRILLIUM TELEPHONE SYSTEMS INC.

Message, Electronic Mail

- 2001 S.N.I. (SATELLITE NETWORK INC.)
- EXTEL COMMUNICATIONS (CANADA)
  - Division of NEI Canada Limited
- GLENAYRE ELECTRONICS LTD.
- NORTHERN TELECOM LTD.

Microwave Systems, Components

- 2001 S.N.I. (SATELLITE NETWORK INC.)
- AEG BAYLY INC.
- ALLIED AMPHENOL PRODUCTS
- ANDREW ANTENNA COMPANY LIMITED
- C/D COMMUNICATION DEVICES INC.
- COM DEV LTD.
- DATAP SYSTEMS
  - Div. of Swan Wooster Engineering Ltd.
- GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.
- HARRIS FARINON CANADA INC.
- LEBLANC & ROYLE TELECOM INC.
- MICROTEL LIMITED
- MITEC ELECTRONICS LTD.
- NORTHERN TELECOM LTD.
- POSITRON INDUSTRIES INC.
- ROCKWELL INTERNATIONAL OF CANADA LTD.
  - Wescom Canada Division
- SED SYSTEMS INC.
- SR TELECOM INC.
- TIW SYSTEMS LTD.
- UNI-TEL LIMITED

Modems

2001 S.N.I. (SATELLITE NETWORK INC.)
AMDAHL COMMUNICATIONS INC.
BAND ELECTRONICS LTD.
DATARADIO INC.
ELECTROHOME LIMITED
GANDALF DATA LIMITED
GLENAYRE ELECTRONICS LTD.
SPAR AEROSPACE LIMITED
UNI-TEL LIMITED

Multiplex

AEG BAYLY INC.
AMDAHL COMMUNICATIONS INC.
COM DEV LTD.
DATAGRAM INC.
GANDALF DATA LIMITED
HARRIS FARINON CANADA INC.
INTERCONTINENTAL DATA CONTROL CORP. LTD. (INTERDACO)
MICROTEL LIMITED
NORTHERN TELECOM LTD.
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division
SPERRY INC.
  Aerospace and Marine Group
TIW SYSTEMS LTD.
UNI-TEL LIMITED

PABX

DATAGRAM INC.
MICROTEL LIMITED
MITEL CORPORATION
NORTHERN TELECOM LTD.
POSITRON INDUSTRIES INC.
TIE/COMMUNICATIONS CANADA, INC.

Subscriber Apparatus

ANTARES TELECOMMUNICATIONS INC.
BAND ELECTRONICS LTD.
C/D COMMUNICATION DEVICES INC.
DEES COMMUNICATIONS ENGINEERING LTD.
LINDSAY SPECIALTY PRODUCTS LTD.
NORTHERN TELECOM LTD.
PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division
TRILLIUM TELEPHONE SYSTEMS INC.

Switching

AUDOR COMMUNICATIONS INC.
DATAGRAM INC.
MICROTEL LIMITED
MITEL CORPORATION
MOTOROLA CANADA, LTD.
  Communications Division
NORTHERN TELECOM LTD.
SED SYSTEMS INC.
SPERRY INC.
  Aerospace and Marine Group
TRILLIUM TELEPHONE SYSTEMS INC.

DATA COMMUNICATIONS SYSTEMS EQUIPMEMT

Data Transmission

AEG BAYLY INC.
AMDAHL COMMUNICATIONS INC.
DEVELCON ELECTRONICS LTD.
FOUNDATION INSTRUMENTS INC.
GANDALF DATA LIMITED
MEMOTEC DATA INC.
MICROTEL LIMITED
MOBILE DATA INTERNATIONAL INC.
NORSAT INTERNATIONAL INC.
NORTHERN TELECOM LTD.
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division
SED SYSTEMS INC.
SPAR AEROSPACE LIMITED
SPERRY INC.
  Aerospace and Marine Group
TIL SYSTEMS LIMITED
UNI-TEL LIMITED
VOLKER-CRAIG LTD.

Modems

AMDAHL COMMUNICATIONS INC.
DATARADIO INC.
DEVELCON ELECTRONICS LTD.
ELECTROHOM LIMITED
FOUNDATION INSTRUMENTS INC.
GANDALF DATA LIMITED
GLENAYRE ELECTRONICS LTD.
MOTOROLA INFORMATION SYSTEMS LTD.
NELMA INFORMATION INC.
NORTHERN TELECOM LTD.
RMS INDUSTRIAL CONTROLS INC.
SPAR AEROSPACE LIMITED
UNI-TEL LIMITED

Multiplex

AEG BAYLY INC.
AMDAHL COMMUNICATIONS INC.
DEVELCON ELECTRONICS LTD.
FOUNDATION INSTRUMENTS INC.
GANDALF DATA LIMITED
HARRIS FARINON CANADA INC.
INTERCONTINENTAL DATA CONTROL CORP. LTD. (INTERDACO)
MEMOTEC DATA INC.
MICROTEL LIMITED
MOTOROLA INFORMATION SYSTEMS LTD.
NORTHERN TELECOM LTD.
RMS INDUSTRIAL CONTROLS INC.
SPERRY INC.
  Aerospace and Marine Group
UNI-TEL LIMITED

Switching

AMDAHL COMMUNICATIONS INC.
C/D COMMUNICATION DEVICES INC.
CANADIAN MARCONI COMPANY
  DataComm Products Division
DEVELCON ELECTRONICS LTD.
GANDALF DATA LIMITED
MEMOTEC DATA INC.
MICROTEL LIMITED
MOTOROLA INFORMATION SYSTEMS LTD.
NORTHERN TELECOM LTD.
PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
RMS INDUSTRIAL CONTROLS INC.
SPERRY INC.
  Aerospace and Marine Group
TIL SYSTEMS LIMITED

INTEGRATED SERVICES DIGITAL NETWORKS (ISDN)

GANDALF DATA LIMITED
MICROTEL LIMITED
NORTHERN TELECOM LTD.

LOCAL AREA NETWORKS

CANSTAR COMMUNICATIONS
COMTERM INC.
DATARADIO INC.
DEVELCON ELECTRONICS LTD.
GANDALF DATA LIMITED
LINDSAY SPECIALTY PRODUCTS LTD.
MEMOTEC DATA INC.
MICROTEL LIMITED
NORTHERN TELECOM LTD.

PACKET SWITCHING

AMDAHL COMMUNICATIONS INC.
DATARADIO INC.
DEVELCON ELECTRONICS LTD.
GANDALF DATA LIMITED
MEMOTEC DATA INC.
MOTOROLA INFORMATION SYSTEMS LTD.
NORTHERN TELECOM LTD.
TIL SYSTEMS LIMITED

POWER LINE CARRIER SYSTEMS

BBC BROWN BOVERI CANADA INC.
TRENCH ELECTRIC
  A Div. of Guthrie Canadian Investments Limited

POWER SUPPLIES

BAND ELECTRONICS LTD.
EXIDE ELECTRONICS CANADA, INC.
FOUNDATION INSTRUMENTS INC.
MECHRON ENERGY LTD.
PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
RELIANCE TELECOMMUNICATION PRODUCTS
  Div. of Reliance Electric Limited
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division

RADIO COMMUNICATIONS

Aeronautical

AUDOR COMMUNICATIONS INC.
GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.
LEIGH NAVIGATION SYSTEMS LTD.
POLESTAR COMMUNICATIONS LTD.
SINCLAIR RADIO LABORATORIES LTD.
SPERRY INC.
  Aerospace and Marine Group

Cellular

2001 S.N.I. (SATELLITE NETWORK INC.)
CANADIAN LARSEN ELECTRONICS LTD.
GLENAYRE ELECTRONICS LTD.
LEBLANC & ROYLE TELECOM INC.
NELMA INFORMATION INC.
NORTHERN TELECOM LTD.
NOVATEL COMMUNICATIONS LTD.
RMS INDUSTRIAL CONTROLS INC.
SINCLAIR RADIO LABORATORIES LTD.

Fixed

CALGARY CONTROLS LTD.
GLENAYRE ELECTRONICS LTD.
GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.
NAUTEL (NAUTICAL ELECTRONIC LABS LTD.)
NOVATEL COMMUNICATIONS LTD.
POLESTAR COMMUNICATIONS LTD.
RMS INDUSTRIAL CONTROLS INC.
SINCLAIR RADIO LABORATORIES LTD.
SPILSBURY COMMUNICATIONS LTD.

Marine

AUDOR COMMUNICATIONS INC.
NAUTEL (NAUTICAL ELECTRONIC LABS LTD.)
POLESTAR COMMUNICATIONS LTD.
RMS INDUSTRIAL CONTROLS INC.
SINCLAIR RADIO LABORATORIES LTD.
SPERRY INC.
  Aerospace and Marine Group
SPILSBURY COMMUNICATIONS LTD.

Microwave Communications
(see COMMUNICATIONS: MICROWAVE SYSTEMS, COMPONENTS)

2001 S.N.I. (SATELLITE NETWORK INC.)
ANDREW ANTENNA COMPANY LIMITED
COM DEV LTD.
GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.
HARRIS FARINON CANADA INC.
LEBLANC & ROYLE TELECOM INC.
MICROTEL LIMITED
MITEC ELECTRONICS LTD.
MOTOROLA CANADA LTD.
  Communications Division
NORTHERN TELECOM LTD.
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division
SED SYSTEMS INC.

Mobile

CALGARY CONTROLS LTD.
CANADIAN LARSEN ELECTRONICS LTD.
GANDALF DATA LIMITED
GLENAYRE ELECTRONICS LTD.
LEIGH NAVIGATION SYSTEMS LTD.
MOBILE DATA INTERNATIONAL INC.
MOTOROLA CANADA LTD.
  Communications Division
POSITRON INDUSTRIES INC.
SINCLAIR RADIO LABORATORIES LTD.
SPILSBURY COMMUNICATIONS LTD.

Packet

DATARADIO INC.
NELMA INFORMATION INC.
RMS INDUSTRIAL CONTROLS INC.

Paging

CALGARY CONTROLS LTD.
GLENAYRE ELECTRONICS LTD.
MOTOROLA CANADA LTD.
  Communications Division
SINCLAIR RADIO LABORATORIES LTD.

Portable

CALGARY CONTROLS LTD.
MOBILE DATA INTERNATIONAL INC.
MOTOROLA CANADA LTD.
  Communications Division
NOVATEL COMMUNICATIONS LTD.
RMS INDUSTRIAL CONTROLS INC.
SINCLAIR RADIO LABORATORIES LTD.
SPILSBURY COMMUNICATIONS LTD.

SATELLITE COMMUNICATIONS

2001 S.N.I. (SATELLITE NETWORK INC.)
ANDREW ANTENNA COMPANY LIMITED
COM DEV LTD.
ELECTROHOME LIMITED
LINCOM INTERNATIONAL COMMUNICATIONS
  Div. of Fisher Technologies Inc.
LINDSAY SPECIALTY PRODUCTS LTD.
MICROTEL LIMITED
MITEC ELECTRONICS LTD.
NORSAT INTERNATIONAL INC.
PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
SED SYSTEMS INC.
SPAR AEROSPACE LIMITED

SPECTRUM MANAGEMENT

2001 S.N.I. (SATELLITE NETWORK INC.)
LEIGH NAVIGATION SYSTEMS LTD.

TELEPHONE EQUIPMENT (see COMMUNICATIONS)

A.E.I. TELECOMMUNICATIONS (CANADA) LTD.
AEA ELECTRONIC LTD.
ANTARES TELECOMMUNICATIONS INC.
CALGARY CONTROLS LTD.
CONSULTRONICS LTD.
DBA COMMUNICATION SYSTEMS INC.
ELECTRO ARTS LTD.
FERRANTI-PACKARD ELECTRONICS LTD.
GLENAYRE ELECTRONICS LTD.
IDACOM ELECTRONICS LTD.
LAB-VOLT LTD.
LEIGH NAVIGATION SYSTEMS LTD.
MICROTEL LIMITED
MICROTRONIX SYSTEMS LTD.
MITEL CORPORATION
McCURDY TELECOMMUNICATION PRODUCTS LIMITED
NORTHERN TELECOM LTD.
POLESTAR COMMUNICATIONS LTD.
PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.
QUALITY COMMUNICATION PRODUCTS (1979) LTD.
RELIANCE TELECOMMUNICATION PRODUCTS
  Div. of Reliance Electric Limited
ROCKWELL INTERNATIONAL OF CANADA LTD.
  Wescom Canada Division
SPILSBURY COMMUNICATIONS LTD.
TRILLIUM TELEPHONE SYSTEMS INC.

TERMINAL DEVICES

Data (Computers)

BAND ELECTRONICS LTD.
COMTERM INC.
CYBERNEX LIMITED
EXTEL COMMUNICATIONS (CANADA)
  Division of NEI Canada Limited
MOBILE DATA INTERNATIONAL INC.
NELMA INFORMATION INC.
NORTHERN TELECOM LTD.
TIL SYSTEMS LIMITED
VOLKER-CRAIG LTD.

Telephone

ANTARES TELECOMMUNICATIONS INC.
BAND ELECTRONICS LTD.
C/D COMMUNICATION DEVICES INC.
CALGARY CONTROLS LTD.
DBA COMMUNICATION SYSTEMS INC.
DICTOGRAPH CORPORATION
NORTHERN TELECOM LTD.
TRILLIUM TELEPHONE SYSTEMS INC.

Telex

EXTEL COMMUNICATIONS (CANADA)
  Division of NEI Canada Limited
NELMA INFORMATION INC.
SPERRY INC.
  Aerospace and Marine Group

TOWERS AND ACCESSORIES

ABROYD COMMUNICATIONS LIMITED
CALGARY CONTROLS LTD.
LEBLANC & ROYLE TELECOM INC.
MITEC ELECTRONICS LTD.
SINCLAIR RADIO LABORATORIES LTD.
TIW SYSTEMS LTD.

VIDEOTEX EQUIPMENT

ELECTROHOME LIMITED
NEW MEDIA TECHNOLOGIES LTD.
NORPAK CORPORATION

INTRODUCTION

Turnkey Telecommunications Systems

A NUMBER OF CANADIAN COMPANIES have specialized in the provision of turnkey telecommunications systems, whether they be back-bone microwave or satellite systems, low capacity radio relay systems, mobile networks, telephone exchanges, cable transmission systems or rural communications facilities. Such companies are vertically integrated so as to provide all the skills and resources necessary to implement a project from initial planning to final systems test and turnover.

Turnkey systems suppliers can perform project feasibility analyses and planning; rate and revenue determination; system planning, field surveys, propagation testing and site selection; civil engineering, systems and equipment engineering; procurement, assembly and integration of equipment and facilities; roads, sites, buildings and facilities construction; installation, system line-up and test; training and on-going systems support and maintenance. Projects can be undertaken on a total turnkey fixed price basis with customized financing structured to accommodate the revenue-generating potential of the system. Special attention is paid to transfer of technological know-how through the development of on-the-job training, integration of the buyer's technicians into the installation team, and establishment of spares depots, maintenance facilities and routine maintenance procedures.

Canadian turnkey contractors incorporate in their systems state-of-the-art components, materials and equipment produced either by the several hundred telecommunications, electronics and related equipment manufacturers in Canada, or those in other countries. The equipment used is selected and, in some cases, adapted specifically to meet the buyer's operating requirements, taking into account up-to-date system operating practices, future expansion requirements and economic restraints in order to provide the most cost-effective solution for the buyer in the most appropriate manner for both the immediate and long terms. The benefits to the buyer include use of uniformly high quality equipment throughout, "tailoring" of the system to meet the operating administration's unique requirements, and development of an operating philosophy incorporating sound telecommunications systems practices.

This section concentrates on firms capable of installing communication systems on a turnkey basis; for example, Intelcan Technosystems has provided flight information and other communication systems to a number of countries. However, turnkey system capabilities are also available from a number of consulting firms (e.g. Alta Telecom is installing microwave facilities in Egypt) and manufacturers (e.g. SPAR Aerospace in the satellite field, and Novatel in cellular radio).

2001 S.N.I. (SATELLITE NETWORK INC.)

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

A.E.I. TELECOMMUNICATIONS (CANADA) LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

ADGA SYSTEMS INTERNATIONAL LTD.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

AEA ELECTRONIC LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

ALTA TELECOM INTERNATIONAL LTD. (ATI)

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

ANDREW ANTENNA COMPANY LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

AUDOR COMMUNICATIONS INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

BELL CANADA INTERNATIONAL INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

BMS COMMUNICATIONS SERVICES LTD.

2176 Willingdon Avenue, Burnaby, BC V5C 5Z9, Canada
Telephone: (604) 293-1831, Telex: 04-352848

BMS Communications Services Ltd. is a supplier of services for both communications transmission and switching requirements. The company provides experts for consulting, engineering or turnkey projects requiring engineering, furnish and installation commitments. Diversification of project management and technical services includes microwave radio, multiplex, supervisory and dc power plant, as well as towers, antennas and transmission lines. For switching, services include EF&I of PABX, EKT, inside, outside cable plant and the provision of interconnect expertise for satellite earth station development.

The company was formed in 1980 as a service-oriented firm providing technical services in the switching area of communications. It later began to sell telephone products, key systems and PBX, and microwave transmission supplies, equipment and services domestically and internationally. The company represents, and has agreements with, internationally known communications equipment suppliers, and has been active in the provision of telecommunications systems in Saudi Arabia, Pakistan, Iran, Thailand and the U.S.

CABLESHARE INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

▶
Message and data communications networks and services offered by CANAC Telecom are backed by 140 years of operating experience in Canada.

CANAC TELECOM

151 Front Street West, Toronto, ON M5J 2N1, Canada
Telephone: (416) 860-2801, Telex: 065-24456

CANAC Telecom is the contracting arm of Canadian National (CN) Communications engaged in the worldwide telecom consulting and turnkey project management.

Drawing on 140 years of operating experience of three affiliated companies, and the resources of other Canadian telecommunications firms, CANAC offers assistance in:
- studies and analysis of technical and financial aspects of telecommunication operations;
- engineering design to both North American and CEPT standards in accordance with CCITT-CCIR recommendations;
- turnkey project management; and
- operations, maintenance and training.

CANAC Telecom, as a consortium partner, was recently awarded a $260M contract for the Canada-USA North Warning System. It calls for the engineering, furnishing, installation and maintenance of the combined satellite and terrestrial telecommunications network linking a line of radar sites located around the North American Arctic area to the main control centres in Canada and the United States.

In addition, the company is involved in several diversified projects such as:

- traffic training of Telephone Organization of Thailand engineers in Canada;
- financial study for the Asian Development Bank of the telephone organization of Burma;
- long distance fibre optic links in Canada and abroad; and
- turnkey rural projects in the Far East involving point to multi-point microwave systems.

CANADIAN MARCONI COMPANY

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

CANSTAR COMMUNICATIONS

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

COMTERM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

CONSULTRONICS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

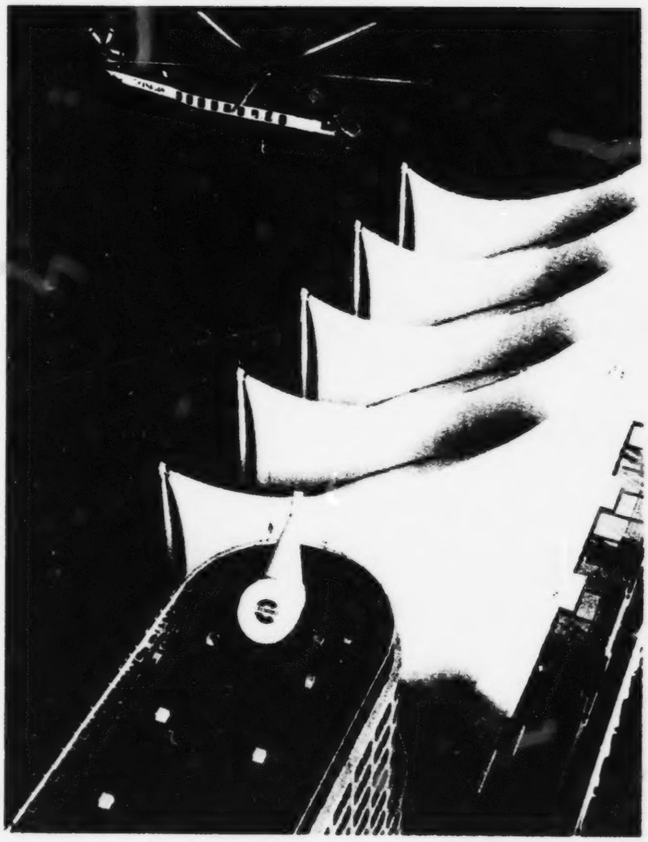
CROWDER COMMUNICATIONS CORPORATION

4312 Norfolk Street, Burnaby, BC V5G 4J9, Canada
Telephone: (604) 437-4433, Telex: 04-356590

As a satellite systems integrator, Crowder Communications Corporation provides services in maintenance and operations management, as well as equipment installation and engineering design. Present systems offered include SMATV/MATV/CATV coaxial cable, TV/Radio rebroadcast, data networking and satellite earth stations.

Founded in the pioneering days of Canada's satellite communications industry, Crowder is a major supplier of satellite products to the Canadian Broadcasting Corporation and Telesat Canada, and has designed and installed satellite networks for broadcast groups and private businesses.

The company's most significant international project to date is the first phase updating of communications for the US Armed Forces DEW line, which involved the installation of satellite earth receiving stations at some 30 Arctic locations, from Alaska to Greenland.



▲
CROWDER Communications installed the satellite telecommunications system in the Pan Pacific Hotel/World Trade Centre Office Complex at Vancouver's Canada Place.

DATAGRAM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

DATAP SYSTEMS

DIV. OF SWAN WOOSTER ENGINEERING LTD.

202-1167 Bowness Road North West, Calgary, AB T2N 3J6, Canada
Telephone: (403) 283-3601, Telex: 038-21572

Datap provides turnkey delivery and licensing of a proprietary telecommunications network monitoring system. Known as IRIS 7, the system centralizes reporting of all network alarms into one control centre.

Datap also offers a computer-aided dispatch system, called CADET, for automating trouble-ticket (installation, service and repair) dispatching operations. The system can enhance customer service by providing closer tracking of trouble-tickets and reduce dispatching costs. CADET also interfaces to IRIS 7.

Datap supplied an IRIS 7 system to GTE Spring Communications Corp. of the US. The company has licensed Cavatel Inc. of Venezuela to supply the IRIS 7 to telephone and oil and gas companies in the South American country.

Incorporated in 1969 as a division of Williams Brothers of Canada Ltd., Datap was originally involved in the design and supply of supervisory control and data acquisition (SCADA) systems for the domestic oil and gas industry. Datap's expertise in SCADA systems has since been extended to telecommunications, electric power grids and bulk materials handling facilities.

DEVELCON ELECTRONICS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

DGB CONSULTANTS INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

DGH COMMUNICATION SYSTEMS LTD.

3761 Victoria Park Avenue, Unit 5, Scarborough, ON M1W 3S2, Canada
Telephone: (416) 499-4746, Telex: 065-26135

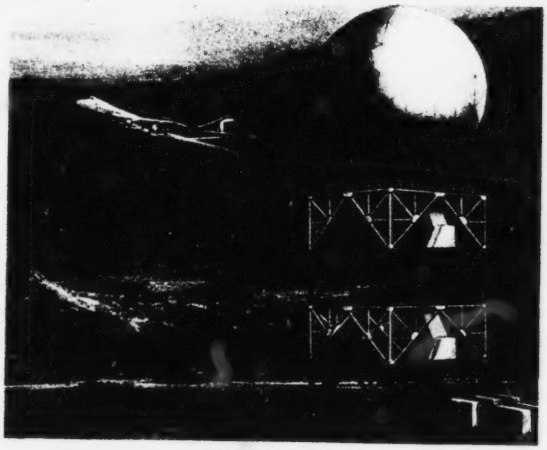
DGH Communication Systems Ltd. is a turnkey supplier of commercial satellite and microwave systems and sub-carrier equipment for stereo sound, voice, data and video transmission applications.

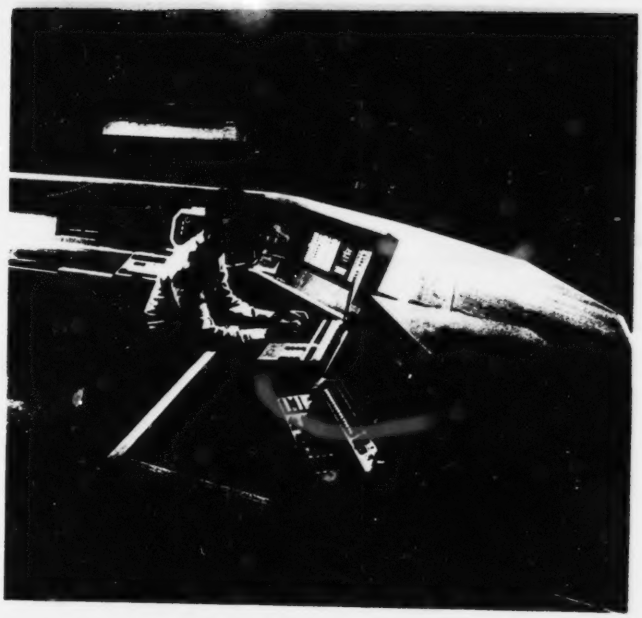
DGH has supplied sub-carrier audio transmission equipment for cable, satellite and broadcast systems in the UK and Holland, and has designed a complete commercial TVRO system for the ARABSAT satellite owned by Saudi Arabia. The company was also responsible for design modifications and the supply of 25 TVRO receivers for Spar Aerospace Ltd.'s recent satellite earth station project with the People's Republic of China.

Incorporated in 1977 as DGH Television Systems Ltd., DGH's charter was the design, supply, installation and maintenance of television and communication systems for the broadcast, CATV and telecommunications markets. The company changed its name in 1985 to reflect its broader expertise in the field of communications. In addition to its own activities, DGH also owns two subsidiaries: DBS Satellite Inc., a specialist in MATV, SMATV and door entry systems for hotels, apartments and condominiums as well as digital radio for business data communications; and Teleport Communication Systems Inc., a supplier of Teleport uplink and downlink facilities for business and commercial communications users.

▲
IRIS 7, from DATAP Systems, remotely monitors and controls over 10,000 network alarms each day in GTE Sprint's newly completed Western Regional Control Centre.

▼
ELINCA: Radar tower with airplane depicting a typical installation for the RAMP project in Canada.





DOUSERV GROUP INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

ELINCA COMMUNICATIONS LTD.

1 Complexe Desjardins, P.O. Box 40, Desjardins Postal Stn., Montreal, PQ H5B 1B2, Canada, Telephone: (514) 282-9534, Telex: 055-60042

Elinca Communications Ltd. is a systems integrator and turnkey supplier of terrestrial and satellite communications equipment, air traffic control and coastal communications systems. As a consortium comprised of a number of Canadian equipment manufacturers, Elinca can supply a vast array of telecommunications products: HF, VHF, UHF, cellular transmitters/receivers; antennas, transmission lines and accessories; microwave, satellite earth stations, satellite subsystems; data transmission systems; weather, air, marine radars; radio relays; mobile telephones; and radio and TV broadcast transmitters, as well as studio-to-transmitter links of air retransmission.

The consortium has strong engineering and telephone network management expertise so that it can offer a full complement of telecommunications services, including: consulting engineering (terrestrial and space); traffic studies (fixed and mobile); specifications; implementation (electrical, electronic and civil) commissioning; maintenance; operations support; billing systems; and training.

Elinca was the prime contractor on a 2,800 km microwave network passing through the West African countries of Benin, Niger, Burkina-Faso (formerly Upper Volta), Mali and Senegal. This system is part of the Pan-African Telecommunications infrastructure. Elinca was charged with the design, supply, transportation, delivery, installation, testing and commissioning of the network, a 2 GHz and 6 GHz microwave system comprised of 50 stations, terminals and repeaters. The project was completed in 1982.

Elinca was formed in 1973. Its membership now consists of: Alberta Government Telephones, Canada's third largest telephone operating company which supplies export skills through its Alta Telecom International Ltd. (ATI) subsidiary; Andrew Antenna Co. Ltd., a supplier of microwave and earth station antennas as well as waveguide and coaxial components; Raytheon Canada Ltd., supplier of air traffic control radars and systems; SNC Enterprises Ltd., a consulting engineering and project management organization with expertise in the telecommunications, broadcast, energy, automation, buildings, industrial plants, transportation and resource engineering disciplines; and Spar Aerospace Ltd., a designer and manufacturer of communications satellites as well as earth segment satellite systems, subsystems and components.

GENESYS GROUP INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

GLOBAL THERMOELECTRIC POWER SYSTEMS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

GNB BATTERIES (CANADA) INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

H. K. DAVIS & ASSOCIATES LIMITED

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

HARRIS FARINON CANADA INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

HN ENGINEERING INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

HOVEY INDUSTRIES LTD.

2378 Holly Lane, Ottawa, ON K1V 7P1, Canada
Telephone: (613) 731-1200, Telex: 053-4922

Hovey Industries Ltd. makes equipment shelters for truck or trailer mounting, equipped with or without power generating equipment, telecommunication equipment and radar equipment. The company also supplies turnkey systems, including small integrated satellite earth stations for wide area telephone service in remote locations in mobile or fixed configurations.

The firm also provides telecommunication system and equipment consulting; system integration; feasibility studies; project management; marketing; engineer, furnish and installation services; transmission, switching and prime power system engineering.

INFOMART

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

▲
INTELCAN Technosystems Inc of Ottawa has furnished turnkey microwave systems to a number of West African countries. Shown here is a remote repeater installation in Sierre Leone that is part of an 800 km microwave network linking that country with Guinea and Liberia.

▼
This user menu was devised by INTELLITECH Canada Ltd of Ottawa for a turnkey spectrum management system that the company supplied to Hong Kong. Intellitech provides custom software packages tailored to the client's requirements.

SPECTRUM MANAGEMENT SYSTEM

MAIN MENU

INTELCAN TECHNOSYSTEMS INC.

130 Albert Street, Suite 1600, Ottawa, ON K1P 5G4, Canada
Telephone: (613) 234-2491, Telex: 053-3833, Cable: TECHNOSYST

Intelcan Technosystems Inc. can deliver a wide array of turnkey telecommunications systems including: microwave and multiplexing systems; VHF/HF radio relay systems; rural telephone and cable transmission systems; monitoring, supervisory control and data communications for hydro-electric, railroad and air traffic control facilities; and industrial telecommunications for developing countries. The company also provides a full complement of training, systems support and maintenance services.

Intelcan has supplied telecommunications systems in about 40 countries. Its major achievements include a 800 km microwave system linking the West African countries of Guinea, Sierra Leone and Liberia. In addition to the microwave system, Intelcan built the central switching centre, an HF radio back-up system, and a network of ground-to-air VHF communications systems. The company is completing a similar 700 km microwave system linking 11 centres in Ghana, Togo and Benin. Among its other international projects, Intelcan has furnished Morocco with a rural telephone network covering 40 remote communities.

Intelcan commenced operations in 1973. As a vertically integrated suppliers of turnkey systems, Intelcan performs feasibility analysis, rate and revenue determination, system planning, field surveys, site selection, civil engineering and propagation testing; systems engineering and design; procurement, assembly and integration of equipment; civil works construction; installation, systems line up and test; and training and maintenance. Most of the off-the-shelf hardware in its systems is sourced from Canadian vendors.

INTELLITECH CANADA LIMITED

81 Metcalfe Street, Suite 400, Ottawa, ON K1P 6K7, Canada
Telephone: (613) 236-7803, Telex: 053-4823

Intellitech Canada Limited offers computer and communication systems engineering, R&D prototype development and consulting; turnkey minicomputer and microcomputer systems for military applications; communications network architectures, protocols, transmission systems, and distributed processing systems including packet networks, local area networks and packet radio; turnkey spectrum management systems for frequency analysis and licensing HF, UHF/VHF and microwave channels; turnkey automated file tracking systems for commercial applications; and microprocessor-based prototypes for data communications encryption and HF packet radio communications applications.

The company, which was founded in 1972, is actively pursuing markets in the Middle East and the Pacific Rim, and has recently completed an installation in Hong Kong.

INTERNATIONAL AERADIO (NA) LTD. (IAL)

23 East Wilmot Street, Richmond Hill, ON L4B 1A3, Canada
Telephone: (416) 731-1300, Telex: 06-964712, Cable: INTAERIO TORONTO

International Aeradio (North America) Ltd. (IAL), a subsidiary of IAL London, specializes in the supply of turnkey communications systems. Equipment and systems include microwave point-to-point radio; multiplex; VHF-UHF mobile radio systems; data communications equipment; telephone exchange equipment; Telex switching equipment; power supply subsystems; towers; antennas; computer aided dispatch systems for transportation (road and rail), public safety, police, fire, ambulance; communications systems for transportation; electric power transmission; oil pipeline control; irrigation control schemes and so on.

The company has been operating in Canada since 1967 and has supplied turnkey communications systems to Africa, the Caribbean, South America, Europe, Greenland, the Far East and the US. IAL is currently working on a $34 million turnkey project in Indonesia.

LEBLANC & KHOREIBI INTERNATIONAL INC.

P.O. Box 880, 514 Chartwell Road, Oakville, ON L6J 5C5, Canada
Telephone: (416) 844-6288, Telex: 06-982226, Cable: LR TELECOM OKVL

Leblanc & Khoreibi International Inc. (LKI) offers turnkey delivery of microwave, VHF, UHF and marine communications systems, as well as broadcast transmitter stations. As a representative of Leblanc & Royle Telecom Inc. in the Middle East and North Africa, LKI also furnishes a wide range of antennas, communications towers and guyed masts (up to 700 metres in height). This service includes installation, foundation work, earthing (grounding), inspection and maintenance.

LKI supplied and supervised the installation of towers and antennas for a 600 km microwave system from Iraq to Saudi Arabia for ARAMCO (American Arabian Oil Company). The firm is now actively pursuing business in Egypt, Algeria, Saudi Arabia, Kuwait, the United Arab Emirates, Pakistan, Iran and India.

LKI is the international marketing arm of Leblanc and Royle Telecom Inc., a group of 19 companies involved in the supply of products and services to the telecommunications and broadcast markets. Incorporated in September of 1984, LKI is majority owned by Leblanc and Royle and partly owned by senior management.

LEBLANC & ROYLE TELECOM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

LEIGH NAVIGATION SYSTEMS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

LINCOM INTERNATIONAL COMMUNICATIONS

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MECHRON ENERGY LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MICROSTAR SOFTWARE LTD.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

MICROTEL LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MITEC ELECTRONICS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MOBILE DATA INTERNATIONAL INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MTX TELECOM SERVICES INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

NORSAT INTERNATIONAL INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

NORTHERN TELECOM LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

NOVATEL COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

PIRELLI CABLES INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

POLESTAR COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

POSITRON INDUSTRIES INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

PYLON ELECTRONIC DEVELOPMENT COMPANY LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SASKTEL INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

SED SYSTEMS INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SPAR AEROSPACE LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SPECTROCAN ENGINEERING INC.

P.O. Box 6088, Station A, 2045 Stanley Street, Montreal, PQ H3C 3Z8, Canada, Telephone: (514) 499-3300, Telex: 055-60735, Cable: MONENCO

Spectrocan Engineering Inc. was formed in 1982 to undertake radio frequency spectrum management projects overseas based on Canada's world leading spectrum management technology. The very rapid growth of national and international communications systems has resulted in a need for more efficient and effective spectrum management facilities. Spectrocan can meet these needs for government agencies responsible for utilization and management of radio frequencies.

Spectrocan offers computer-based radio frequency licensing, record keeping and accounting systems, spectrum engineering services, training and organizational development services, radio frequency monitoring stations and vehicles, spectrum engineering laboratory facilities, and operations and maintenance assistance either as a turnkey project or a specific technology packages.

Spectrocan is part of Monenco Ltd., a diverse consulting and engineering group of companies with over 75 years' experience in overseas projects.

SPERRY INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SPILSBURY COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

SR TELECOM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

TIL SYSTEMS LIMITED

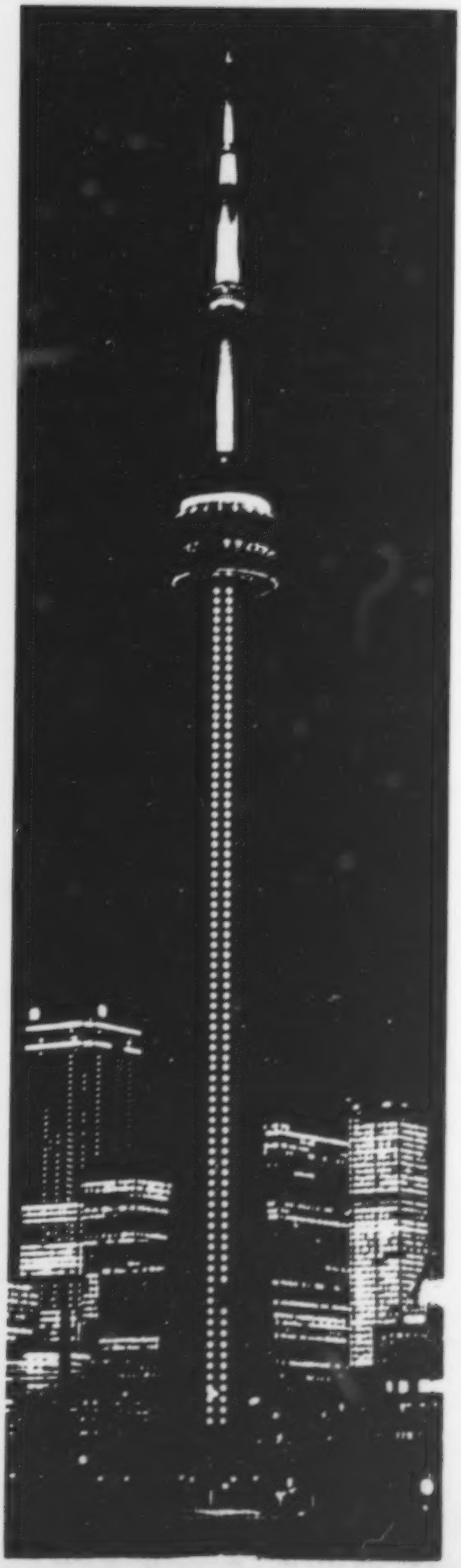
A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

TSI TELECOMMUNICATION SERVICES INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

WILLIAM G. HUTCHISON & COMPANY

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.



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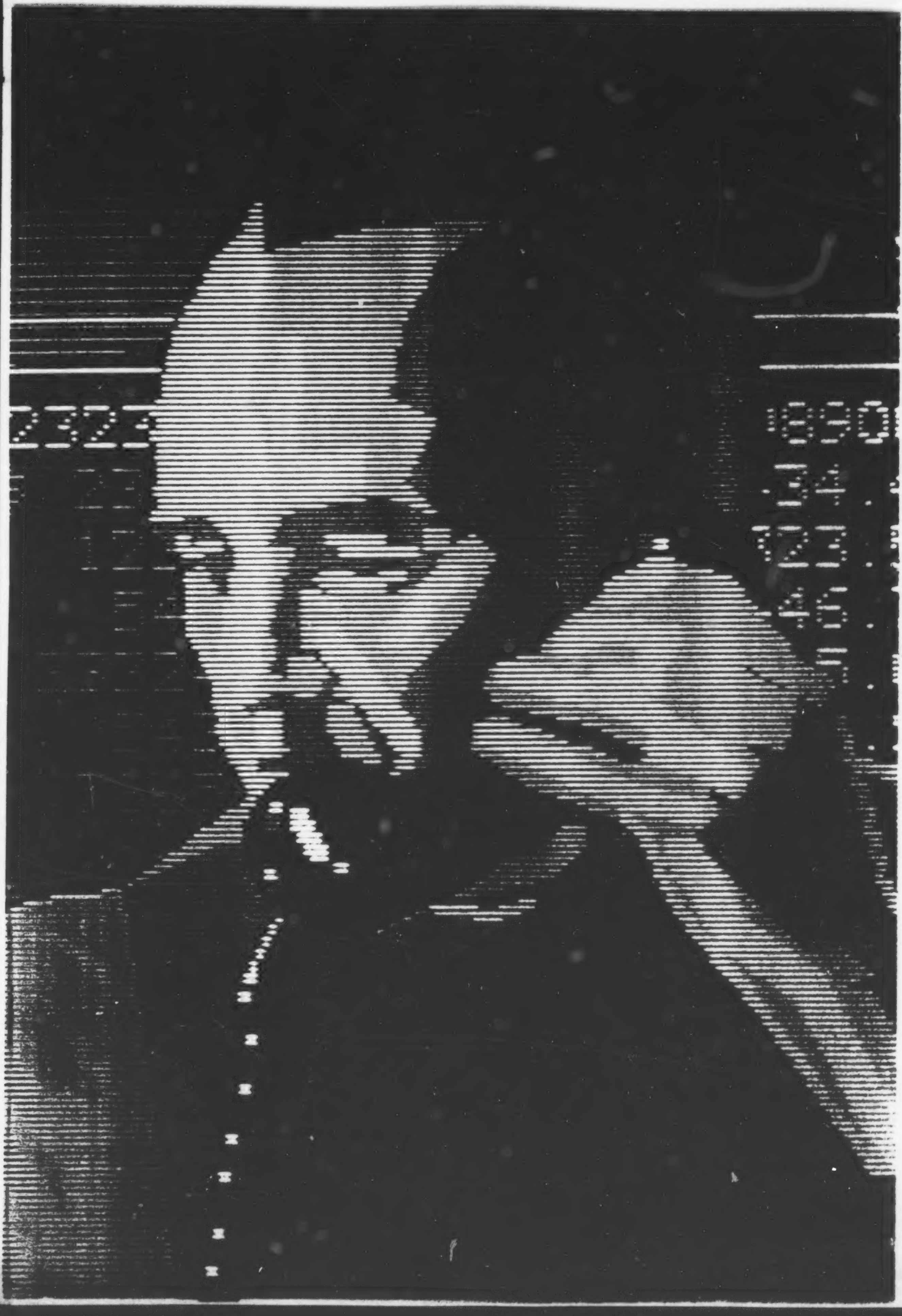
The famous CN communications tower, the tallest free-standing structure (553.3m) in the world. Among other uses, the tower houses microwave antennas and equipment for radio communications and for transmission of TV broadcast signals. Courtesy of CANAC Telecom.



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INTRODUCTION

Information Systems For Telecommunications

WITH ITS WORLD-CLASS telecommunications industry, it is not surprising that Canada has also produced a wide range of companies in the field of information systems. These companies are characterized by an unusually strong capability in computer applications with telecommunications aspects.

The availability of high-quality education and the mobility of experts has led to significant levels of "cross-fertilization". This, and Canada's open business policies and market environment, provides a wealth of opportunities to broaden job experience and apply innovative capabilities to the benefit of customers.

For this publication, a sampling of information systems companies was made on the basis that their products are widely used by telecommunications carriers themselves, either to enhance productivity or to offer value-added services to subscribers.

Examples of information systems products and services covered in this publication include:

- software and systems for value-added networks and services,
- network management software and systems,
- data communications equipment (modems and multiplexers),
- data terminal hardware,
- a broad range of X.25 network equipment,
- X.400 messaging software,
- data transmission over radio.

A companion publication, entitled "Computing Products for World Markets" covers a more complete range of Canadian computing companies offering products and services for export. Many of these have a strong telecommunication aspect. Some examples include:

- communications accounting software for microcomputers,
- teletex terminal emulators for personal computers,
- computers and terminals which use non-Latin alphabets (e.g. Arabic),
- videotex and electronic publishing systems,
- teleshopping,
- library systems,
- graphics systems,
- data networks (including LANs),
- distance education systems,
- on-line banking and finance systems,
- point-of-sale systems,
- remote sensing systems,
- integrated software and hardware for office automation including local area networks,
- terminal drivers and terminal emulation software for large mainframe computers.

Of course, that publication also covers many other computing products, including turnkey systems and computer hardware and software for non-telecommunication applications.

ALTA TELECOM INTERNATIONAL LTD. (ATI)

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

BELL CANADA INTERNATIONAL INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

CABLESHARE INC.

20 Enterprise Drive, London, ON N6A 4L6, Canada
Telephone: (519) 686-2900, Telex: 064-5693

Cableshare Inc. develops, markets and implements computer software and systems in the areas of computer communications, home shopping and electronic marketing. Through its three operating divisions, the company offers X.25-based packet data communication products, switched turnkey packet assembly/disassembly systems for asynchronous, synchronous, Telex and teletex devices, videotex frame creation and authoring system, videotex/videodisc point-of-sale systems, home shopping systems utilizing videotex/videodisc, telephony and cable TV technology, and electronic mail and messaging systems.

Cableshare was founded in 1973. Recent international projects include the installation of over 300 LSI-X.25 communication processors linking the Ford Motor Credit Company offices throughout the US and Canada; the supply of X.25 front-end processors providing packet switching support for an electronic funds transfer network in over 55 countries for a major US financial institution; installation of videotex/videodisc systems in the US; and distribution of its NAPLPS frame creation system and videotex/videodisc system in Japan and the Far East.

CANAC TELECOM

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

CEGIR

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

COMTERM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

DATACAP LTD.

220 Laurier Avenue West, Suite 600, Ottawa, ON K1P 5Z9, Canada
Telephone: (613) 238-6363, Telex: 053-4433

Datacap Ltd. is a consulting organization specializing in telecommunications, spectrum management and remote sensing. The company provides consulting and project management services including radio spectrum management systems, strategic planning and policy studies relating to communication management, telecommunications and navigation aids system engineering. Also remote sensing studies in technology and resource management, engineering and financial computer systems consulting, ranging from feasibility studies and cost-benefit analysis through to design and implementation, and feasibility studies and design of expert systems using artificial intelligence techniques.

Datacap has been in business since 1969, and is actively pursuing export markets.

DATAGRAM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

DGB CONSULTANTS INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

DOUSERV GROUP INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES

ForceTen ENTERPRISES INC.

3845 Dutch Village Road, Halifax, NS B3L 4H9, Canada
Telephone: (902) 453-0040, Telex: 019-22875

ForceTen is a supplier of administrative telecommunications software. The company has offices and representatives in the US and the UK, as well as in Canada.

ForceTen offers three modular products which form the basis of a complete customer records information system. CRB Plus incorporates multiple databases to process customer records and billing functions. SERVICE Plus handles multi-line business orders, special orders and single-line orders. MESSAGE Plus edits EMR data, rates messages, and prepares results for billing. Major installations of these products have been made in Canada and the US, with further installations intended for Europe and Asia.

The company's principal shareholder is Maritime Telegraph & Telephone Co. Ltd., an operating telecommunications carrier which provides services throughout the Canadian province of Nova Scotia.

GANDALF DATA LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

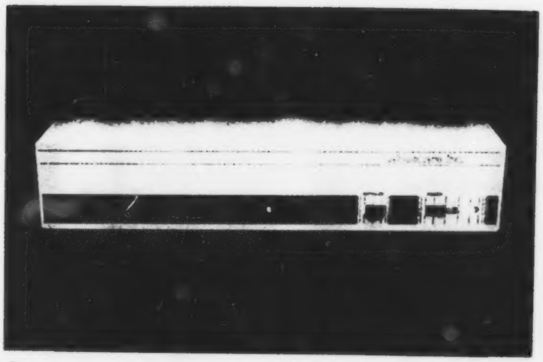
GENESYS GROUP INC.

1775 Courtwood Crescent, Ottawa, ON K2C 3J2, Canada
Telephone: (613) 226-8740, Telex: 053-4798

Genesys Group Inc. provides consulting and contract software development services to both government and industrial clients. The company's specialty is text and graphics database management and communications systems, and it has installed turnkey systems with up to 75 terminals. Genesys has extensive experience in integrating hardware and software, acceptance testing, shipping and installing equipment.

Off-the-shelf and custom software products include interactive videodisc/videotex systems, computer graphics management systems, business graphics systems, directories, computer-to-computer communications software and front-end database systems/terminal control. The company has clients in Canada, the US and Japan, and has developed and delivered fully documented software products to Digital Equipment Corporation and Toshiba Corporation for worldwide distribution.

Genesys also offers service bureau facilities, consulting, feasibility studies, computer system facility management, training, technical writing, systems analysis and evaluation and system assurance testing.



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CABLESHARE's CSI.25 concentrator connects asynchronous and synchronous devices to public or private packet switched networks. The CSI provides low cost integration of various networking protocols and supports a full range of network management applications.

I. P. SHARP ASSOCIATES LTD.

2 First Canadian Place, Suite 1900, Toronto, ON M5X 1E3, Canada
Telephone: (416) 364-5361, Telex: 06-22259

I. P. Sharp Associates Ltd. (IPSA) is a pioneer in packet-switched technology with IPSANET, an international packet-switched network. Continuously monitored and maintained, the network has never been down, delivering reliable service during network expansion, reconfiguration and interconnection to other networks such as Tymnet, Telenet, Datapac, PSS, Transpac and Telex. The "network" also includes technical support staff in 22 countries.

I. P. Sharp Associates maintains a very large on-line numeric data base, containing stock and commodity prices, financial and economic data, energy prices and data, and aviation data. The data is accurate and timely, and complemented by easy-to-use retrieval software.

I. P. Sharp Associates also has expertise in international real-time banking systems, international systems for the investment industry, powerful user-friendly information centre products (data management, query, reporting, graphics, electronic mail, statistics and project management), and productivity tools for the development centre.

SHARP APL is the company's branded version of APL. Consistent with the APL standard, but offering features which further improve productivity, reliability and efficiency, the SHARP APL timesharing system offers IPSA programmers and its clients an effective environment for productivity.

I. P. Sharp Associates Ltd. has 47 offices in 23 countries. The expert personnel in these offices understand the needs of local businesses and multinational corporations and can adapt global systems to custom solutions. In addition, the local support team provides training, APL consulting and technical support.

IDON CORPORATION

P.O. Box 3728, Station C, 875 Carling Avenue, Ottawa, ON K1Y 4J8, Canada, Telephone: (613) 722-8101, Telex: 053-4370

Founded in 1983, IDON Corporation deals with communications and information handling problems.

The company is currently involved in: the development of electronic map and chart systems; the development of a network-based videodisc/NAPLPS/graphics training system; and the development and standardization of a coding methodology for the communication and representation of Blissymbols.

IDON provides unique expertise in standards consultation and software design in such international videotex protocols as DATAVISION, PRESTEL, CAPTAIN, CEPT and NAPLPS. One of the company's latest projects has been the development of a specific videotex software translator/decoding package for DATAVISION-PRESTEL-NAPLPS.

INFOMART

164 Merton Street, Toronto, ON M5S 3A8, Canada
Telephone: (416) 489-6640, Telex: 06-22111

Infomart markets videotex system software and consulting services. The company provides complete project management services for videotex systems, including: videotex system software installation and application software development; configuration, selection and installation management of host computer equipment; selection and installation of public terminals; design and installation of networks; and training of client management personnel in the operation of videotex systems. Infomart's primary products are: ITSS videotex system software; "Grassroots", the agribusiness information service; "Teleguide", the public access travel and tourism service; the VANILLA decoder, a NAPLPS software decoder for the IBM PC; and Private File Service, an advanced database management and on-line retrieval service.

Infomart is a division of Southam Inc., a large Canadian publishing company. Founded in 1975, Infomart is a leading supplier of videotex products and services, as well as the operator of an on-line file service.

INTELLITECH CANADA LIMITED

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

INTERNATIONAL PHASOR TELECOM LTD.

1500 West Georgia Street, Suite 1690, Vancouver, BC V6G 2Z6, Canada
Telephone: (604) 683-7636

International Phasor Telecom Ltd. specializes in information, communication and transaction security software products through advanced encryption technology. The company has developed an efficient and cost-effective microcomputer privacy system using public key encryption which provides information protection and security for both stored and transmitted data for business use. The Phasor Code (tm) 1000 is used by GTE Telenet Communications Corp. in the US for use with its Telemail electronic mail service. The company has also developed Phasor Card, a security system for verification and accreditation of credit cards.

International Phasor has been in business three years, and has sold its security products to companies in Ireland, Belgium and the Middle East. The company is interested in establishing working relationships with suppliers of electronic mail services.

MICROSTAR SOFTWARE LTD.

14 Concourse Gate, Suite 400, Nepean, ON K2E 7S6, Canada
Telephone: (613) 727-5696

Microstar Software Ltd. is a full-service company specializing in microcomputer and micro to mainframe solutions. The company has special expertise in the areas of graphics, communications and data encryption. End-user products include: Personality+III(tm) and MVDI-C(tm) videotex/ASCII communications packages; MVDI-T(tm), a comprehensive graphics developer's toolkit; and Microstar Encryption library, a library of ANSI-DEA/FIPS-DES encryption routines.

The company has extensive consulting and product development experience in applied videotex technology. As an expert in the use of personal computers in videotex, Microstar can develop or enhance communications, public access, host data base or frame creation products. Established in 1983, the company has shipped custom and standard software products to customers in the US and Europe.

MOTOROLA INFORMATION SYSTEMS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

NELMA INFORMATION INC.

5170A Timberlea Boulevard, Mississauga, ON L4W 2S5, Canada
Telephone: (416) 624-0334

Nelma Information Inc. designs and markets a line of data communications equipment. Its principal products are: ESTeem wireless modem; QuEST wireless computer; a Universal Teletex Controller (UTC); and NII502 user programmable communications terminal.

NEW MEDIA TECHNOLOGIES LTD.

4664 Lougheed Highway, Suite 108, Burnaby, BC V5C 5T5, Canada
Telephone: (604) 291-7111

New Media Technologies Ltd., founded in 1984, offers products that support the NAPLPS videotex standard. One of the company's founders participated as a full member of the prestigious joint international ANSI/CSA working group, which developed the NAPLPS standard.

New Media's NAPLPS-based PIRT (public information retrieval terminal) is designed for public access applications. A NAPLPS decoder, 13" or 19" CRT screen and a touch-sensitive keypad are standard, and optional magnetic card reader, touch screen, video disc, printer or full alphanumeric keyboard may be added. New Media enclosures can be customized to meet the needs of many environments in a variety of finishes.

New Media also manufactures an integrated business videotex terminal, the VTX-208, which displays videotex graphics and standard text, and can be connected to a printer for color or black-and-white print-outs.

NOVATRON INFORMATION CORPORATION

6080 Young Street, Suite 401, Halifax, NS B3K 5L2, Canada
Telephone: (902) 453-4620, Telex: 019-22771

Novatron Information Corporation offers consulting, turnkey installation and sales of its "Supplyline" products, an on-line sourcing database which lists products and services offered by 86,000 Canadian companies. The company also provides consultation and installation of turnkey channel systems for on-line purchasing.

Novatron has implemented and offers consulting services on three principal communications standards: X.12 (electronic document interchange); X.25 (packet switching); and X.400 (electronic mail). The company, which has been operating in Canada for ten years, has international experience in Southeast Asia, Norway and the West Indies.

POLESTAR COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

SASKTEL INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

SPERRY INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SYDNEY DEVELOPMENT CORP.

1385 West 8th Avenue, Suite 600, Vancouver, BC V6H 3V9, Canada
Telephone: (604) 734-8822, Telex: 04-54357

Sydney Development Corporation specializes in the development, marketing and support of software systems. The company's line of mainframe, mini and microcomputer software products include X.25, Bisync, SNA and X.400 communications software products. These permit OEMs, value-added networks and systems integrators to extend their products to include up-to-date protocols based on CCITT and other international standards. The company has a strong research and development program, which includes ISDN and LU6.2, and also offers porting and consulting services.

Sydney has sold its X.400 product for international electronic messaging to major computer manufacturers in North America and Europe. The company has also exported the X.400 and other communication products to Australia, the US, Switzerland and West Germany.

Founded in 1978, Sydney has development centres in Canada and England, as well as a US subsidiary, Sydney Data Products Inc. UK-based Sydney Limited has several offices in Britain.

TELEGLOBE CANADA

680 Sherbrooke Street West, Montreal, PQ H3A 2S4, Canada
Telephone: (514) 289-7272, Telex: 05-61743, Twx: 610-421-4461,
Cable: TELEGLOBE MONTREAL

Teleglobe Canada is Canada's international telecommunications carrier. Through an extensive network of submarine cable and satellite facilities, Teleglobe provides a complete range of international telecommunications services.

Teleglobe has developed a computerized Network Inventory System (NIS) for its own needs. It is an on-line IMS-based operational system that monitors circuit implementation and facility usage, allows quick circuit order entry and re-routing, and provides reporting capabilities. NIS provides accurate and up-to-date network status reports on demand, allows better control of network resources and simplifies major network configuration and reconfiguration. Teleglobe has demonstrated the system to communications firms in North America, Australia and the Far East.

Internationally, Teleglobe also offers MIS (Management Information System) consulting services, primarily in the areas of strategic and operational

TIL SYSTEMS LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

TSI TELECOMMUNICATION SERVICES INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

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TELEGLOBE: Network Control Centre, Montreal, Québec.

INTRODUCTION

Consulting Services

ONE OF CANADA'S GREATEST CONTRIBUTIONS to the world of technology has been in the field of telecommunications. With the invention of the world's first telephone, communications emerged as a vehicle for Canadian creativity. That creativity has set technological standards that paved the way for immense developments in high technology which are felt and experienced around the world.

Canadian telecommunications consulting is a direct descendant of this high tech creative society. Canada is unique in the fact that out of necessity for itself to communicate across its vastness it assumed the leadership required to have one of the world's most sophisticated telecommunications systems.

Canadian telecommunications consultants are also unique in their ability to create technology that provides the answers and solutions to reshape the basic and traditional structures of daily living habits anywhere in the world.

"Canada has been there" is a phrase which our tele-consultants can use and defend anywhere in the total spectrum of telephony provisioning. It has been said that rapid development of technology results in a turnover of information every five to eight years, thus creating the problem of integrating the old with the new. Canadian consultants thrive upon this creative mandate.

Each of the many geographical sectors of Canada has produced a uniquely different and experienced consultant, reflecting diversity yet forming an integrated systems approach which is second to none.

This section on consulting services lists a number of firms specializing in the provision of telecommunication services. These includes technical assistance, planning, tendering and bid evaluation, project installation, operation, maintenance and training as well as studies such as rate structures and the supply of senior management services.

ABROYD COMMUNICATIONS LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

ADGA SYSTEMS INTERNATIONAL LTD.

116 Albert Street, Suite 400, Ottawa, ON K1P 5G3, Canada
Telephone: (613) 237-3022, Telex: 053-4568, Cable: ADGAOTT

The ADGA Group provides a wide range of professional engineering and technical services in consulting, design, installation, operations and maintenance, logistics support and training for marine communications, air traffic control, microwave and satellite systems, and marine vessel traffic management. On major international telecommunications projects, ADGA generally assumes the role of a subcontractor, offering specialized expertise in microwave systems, satellite communications and earth stations, HF/VHF/UHF communications and telemetry.

Noteworthy offshore projects include: the operations and maintenance of an Intelsat V earth station for the government of Bangladesh; and the re-commissioning of air traffic control, microwave and satellite communications systems for the Republic of Angola.

ADGA is a private, wholly Canadian-owned company founded in 1967. A certified professional engineering organization, ADGA has undertaken a number of major operations and maintenance programs in Canada. Its current activities include the maintenance of security and communications equipment at all federal penitentiaries and the maintenance of electronics hardware for Environment Canada's ice reconnaissance aircraft.

AEA ELECTRONIC LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

ALTA TELECOM INTERNATIONAL LTD. (ATI)

10025 Jasper Avenue, Suite 220, Edmonton, AB T5J 1S6, Canada
Telephone: (403) 425-4262, Telex: 037-3911

Alta Telecom International Ltd. (ATI) puts design and operating skills to work for international telecommunications users and provisioners. Owned by one of Canada's leading telecommunications companies, ATI is committed to the transfer of technology, be it through sponsored fellowship training programs or offshore technical engineering project management.

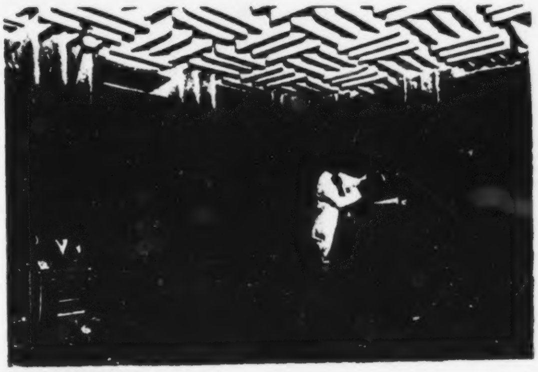
ATI has many interests throughout the world, currently in Indonesia, Thailand, Egypt, Puerto Rico, Colombia and the continental United States. ATI has completed 45 projects in some 30 countries around the globe, providing results oriented solutions.

ANGUS TELEMANAGEMENT GROUP INC. (ATMG)

2175 Sheppard Avenue East, Suite 210, North York, ON M2J 1W7,
Canada, Telephone: (416) 494-4440

Angus TeleManagement Group (ATMG) is a management consulting firm specializing in telecommunications. Consulting services include assistance to end-users in the specification and acquisition of telecommunications systems; market research; product planning and research; sales training; management training; and executive briefings on telecommunications trends.

ATMG publishes "The Telemanagement Report", a monthly newsletter on trends in business telecommunications in Canada, and "Voice-Data Report", a monthly newsletter on voice-data integration, voice-processing and ISDN.



APREL INC.

38 Antares Drive, Nepean, ON K2E 7Z2, Canada
Telephone: (613) 727-0334

Aprel Inc. offers testing services to Canadian, US and international standards, and research and development in telecommunications, electroacoustics and electromagnetics. The company also undertakes pilot manufacturing to support the specialized needs of customers, and modification of client equipment for compliance to standards.

Aprel has completed major contracts for Plessey Office Systems, UK and Argentina, TIE/communications, US, Hyundai Electronics, Seoul, Korea, and Welch-Allyn, US. The company has also done extensive work for a number of Canadian clients and is currently writing international standards as part of the Canadian delegation to IEC, and acting as liaison for CCITT in Geneva.

Aprel was established in 1981, the company maintains modern facilities which include a full-sized anechoic chamber, shielded rooms, acoustic rooms, IEC listening rooms and specialized test equipment calibrated to the National Research Council and the National Bureau of Standards. The company is accredited by the Canadian Federal Department of Communications and the US Federal Communications Commission.

AUDOR COMMUNICATIONS INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

BELL CANADA INTERNATIONAL INC.

One Nicholas Street, 8th Floor, Ottawa, ON K1N 9M1, Canada
Telephone: (613) 563-1811, Telex: 053-4849

Bell Canada International Inc. offers expert services in all areas of telecommunications to overseas clients, including consulting and training, installation, operations and maintenance, and management of the telecommunications environment, from network and customer services to support and management services. As a subsidiary of Bell Canada Enterprises, the company has access to the technical, managerial and scientific expertise of Bell Canada, Northern Telecom and Bell-Northern Research, and has managed projects in more than 60 countries, including the operation, maintenance, and management of the Saudi Arabia Telephone Expansion program since 1977.

BCI has also advised and assisted the Trinidad and Tobago Telephone company since 1982 during a major expansion and modernization program. In Africa, BCI was retained by the Canadian International Development Agency to supervise the construction of a 3000 km microwave system serving five nations—Senegal, Benin, Mali, Niger and Burkina Faso—and to provide managerial training and technical services. In Malaysia, BCI is assisting Jabatan Telekom Malaysia in developing a Customer Automated Services System.

BCI also operates an Executive Development Centre in Toronto, which provides telecommunications training (see separate listing).

BMS COMMUNICATIONS SERVICES LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

CABLESHARE INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

CANAC TELECOM

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

CANADIAN PACIFIC CONSULTING SERVICES LTD.

740 Notre Dame Street West, Suite 760, Montreal, PQ H3C 3X6, Canada
Telephone: (514) 876-1900, Telex: 055-60147

Canadian Pacific Consulting Services Ltd. (CPCS) is the consulting arm of the Canadian Pacific group of companies. CPCS provides project services in the telecommunications and transportation sectors, including feasibility studies, planning, engineering design and project management of general and special purpose telecommunications systems—microwave, satellite and fibre optic transmission facilities, voice, message and data switching networks, SCADA, mobile radio and closed-circuit TV. The company also provides technical and management assistance in operations, maintenance, staffing and training for telecommunications organizations, including PTTs, transportation (railways, urban transit, aviation, pipelines) and public utilities.

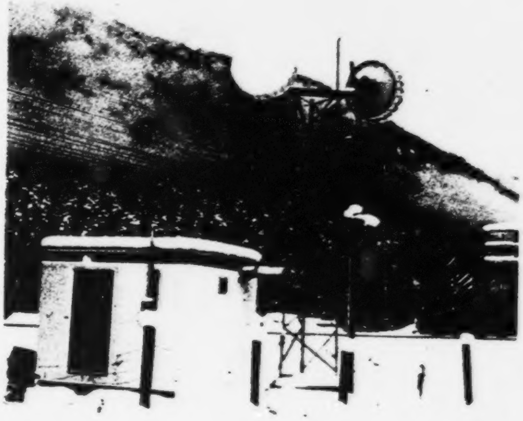
Since its creation in 1969, CPCS has worked in some 58 countries. Recent international projects include a telecommunications training program for the East African Post and Telecommunications Corporation, a feasibility study and preliminary design and engineering for a complete telecommunications system for the Algerian State Railway and the implementation of a full-scale telecommunications network for the Republic of Indonesia's Bukit Asam Coal Rail Transportation project.

In addition to its Montreal corporate headquarters, CPCS has offices in the US, Europe, Asia and Central America.

▲
Since 1977, BELL CANADA International has been assisting and advising in the management and operation of Saudi Telecom in the Kingdom of Saudi Arabia, and training Saudi nationals to undertake the complete management of the network. Here, BCI advisor explains a computerized system.

◀**OPPOSITE PAGE:**
APREL Inc.'s new, modern facilities include a full-size anechoic chamber.

▼
Canadian Pacific Consulting Services Ltd. is part of the Canadian Pacific group of companies, offering project services in the telecommunications and transportation sectors. Pictured, CP Rail's 18 GHz trackside radio system.



CEGIR

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

COM DEV LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

CROWDER COMMUNICATIONS CORPORATION

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

DATACAP LTD.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

DATAP SYSTEMS

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

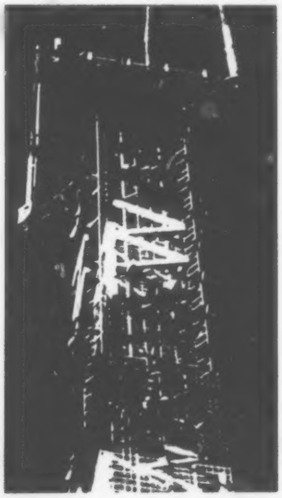
DGB CONSULTANTS INC.

1 Complexe Desjardins, P.O. Box 40, Desjardins Postal Stn., Montreal,
PQ H5B 1B2, Canada, Telephone: (514) 282-9531, Telex: 055-60042

DGB Consultants Inc. provides systems engineering, consulting and turnkey delivery of microwave, satellite and mobile radio communications, electromagnetic radio spectrum management and police information management and computer-aided dispatching mobile systems. DGB supplies standard computerized packages for spectrum management systems and computer-aided dispatch systems together with fixed and mobile radiocommunications (microwave, HF/VHF/UHF) for police information management requirements.

DGB has provided consulting for, and turnkey delivery of, a spectrum management system for the Hong Kong Post Office. The firm participated with Elinca Communications in the construction and system integration of the PANAFTEL project.

DGB Consultants was founded in 1959. In 1969, it joined The SNC Group of Montreal as a wholly-owned subsidiary and broadened its consulting services into telecommunications, audio/visual communications and broadcasting. When SNC restructured its subsidiaries in 1984, DGB became a department of SNC's integrated communications systems division. Its prime role in that group is the provision of telecommunications consulting and engineering resources.



▲▶
DGB: Radio-TV, Satellite communications.

DGH COMMUNICATIONS SYSTEMS LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

DOUSERV GROUP INC.

1200 McGill College Avenue, Suite 1930, Montreal, PQ H3B 4G7,
Canada, Telephone: (514) 866-5836, Telex: 065-26135

Douserv, a group of consultants, engineers, project managers, technical assistants and operations and maintenance support personnel, offers feasibility and other studies, design, project management, construction supervision, technical assistance and training.

Telecommunications expertise ranges over voice, messages, data, picture transmission by satellite, microwave, coaxial cable and optical fibre; radiocommunications for fixed and mobile services, radio paging and telephony systems; rural telephone networks and local area networks for integrated telecommunications services; and specialized telecommunications applications for air transportation, maritime vessel traffic, railways and energy pipelines. Training services include on-the-job, formal, and computer-aided training.

The company has been active with the Canadian International Development Agency in West Africa, with International Civil Aviation Organization in Central America and Tanzania, with ARAMCO in Saudi Arabia, and in Peru. Currently involved in the CABLON consortium in Europe.

ELINCA COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

ForceTen ENTERPRISES INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

GENESYS GROUP INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

H. K. DAVIS & ASSOCIATES LIMITED

1090 West Georgia Street, Suite 200, Vancouver, BC V6E 3Z7, Canada
Telephone: (604) 687-2040

H. K. Davis & Associates Limited is a group of consulting engineers, planners, scientists and economists with expertise in all fields of communications, from acoustics to light optic transmission. Services provided by the company range from feasibility studies and concept development to detailed design and system specification, supervision of construction, commissioning, and operations and maintenance training.

Over its twenty-two year history, the company has gained experience in consulting services for acoustic/vibration, analog/digital telephone, integrated voice and data, satellite TV and TVRO, narrow band radio, broadcast radio and television stations and networks, broadband cable and CATV, fibre optic systems for integrated video, audio, voice and data transmission, transit systems, and a wide range of business office and industrial communications applications.

HN ENGINEERING INC.

124-4664 Lougheed Highway, Burnaby, BC V5C 5R7, Canada
Telephone: (604) 294-3401, Telex: 04-354623

HN Engineering Inc. specializes in communications systems consulting. The company's broad range of services includes feasibility and cost studies for all forms of communications systems; design and specifications for outside plant and transmission equipment; telephone traffic studies and system planning for telephone companies; tariff development, rate hearings support and participation in toll charge settlement negotiations; design and specification for radio dispatch, SCADA and CATV systems; RF field strength and interference studies; system design for HF, VHF, UHF radio and high capacity microwave; and MF, HF and VHF broadcast transmission plant design and testing.

HNE has been in business since 1959 and is an employee-owned firm. Through its wholly-owned subsidiary, TECOM Systems Inc., the company has the capability for the implementation of system designs. HNE has been involved in projects in Africa, the Middle East, Far East, US and South America.

HOVEY INDUSTRIES LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

I. P. SHARP ASSOCIATES LTD.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

IDON CORPORATION

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

INFOMART

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

INFORMATICS EDUCATION LTD.

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

INSTITUT INTERNATIONAL DE LA COMMUNICATION

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

INTELCAN TECHNOSYSTEMS INC.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

INTELLITECH CANADA LIMITED

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

INTERNATIONAL AERADIO (NA) LTD. (IAL)

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

INTERNATIONAL PHASOR TELECOM LTD.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS

LINCOM INTERNATIONAL COMMUNICATIONS

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

MICROTEL LEARNING SERVICES

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

MTX TELECOM SERVICES INC.

P.O. Box 6666, 360 Main Street, 12th Floor, Winnipeg, MB R3C 3V6,
Canada, Telephone: (204) 941-8757, Telex: 07-587637, TWX:
610-641-9518

MTX Telecom Services Inc. offers consulting services in telecommunications design, planning, implementation and support; procurement and acquisition of equipment; specialized support in network design and management; and value-added telecommunications services. The company will work with local companies in joint ventures or other arrangements suited to local requirements, including consortiums, for delivering major contracts. MTX has also recently moved into the manufacture and marketing of an automatic communications and telenetworking product, a three-phase board level product utilizing personal ID numbers to provide telephone management functions.

MTX is a wholly-owned subsidiary of the Manitoba Telephone System, established in 1982 to provide telecommunications consulting services outside the province of Manitoba. The company has handled projects in India, South America, Trinidad, Australia, Holland and the UK, and is involved in a joint venture in Saudi Arabia, owning 50% of Saudi Arabian Datacom Ltd. MTX is also currently consulting to the Mercury Group of London for operations review, including introduction to network management, and has an extensive background in broadband CATV services.

NOVATRON INFORMATION CORPORATION

A full description of this firm's capabilities is contained in
the section on INFORMATION SYSTEMS.

ONTEL COMMUNICATIONS INC.

95 Barber Greene Road, Suite 112, Don Mills, ON M3C 3E9, Canada
Telephone: (416) 446-5435, Telex: 06-966802

Ontel Communications Inc. offers consulting engineering and project management services, in the study, design and implementation of communications facilities from VF through to microwave and satellite systems. Services encompass electronic and civil/structural engineering and related project management activities for HF radio, fixed and mobile VHF/UHF radio, cellular radio, microwave radio, tropospheric scatter radio and satellite earth stations. Similar services are available for studio and transmission facilities, and communications systems related to airports and public safety/emergency organizations.

Services include pre-design and feasibility studies; evaluation of existing electronic facilities; design of new and upgraded systems; definition of budgets and project schedules; preparation of tender documentation and analysis of bids; contract administration; preparation of engineering briefs and licensing documentation; definition of maintenance plans; and personnel sourcing and training.

Ontel is jointly owned by Imagineering Limited and Morrison Hershfield Limited, two Canadian consulting engineering firms in communications and civil/structural engineering. The firm has been active in Indonesia, the Middle East and Venezuela.

PLAN TEL INC.

5660 Monkland Avenue, Montreal, PQ H4A 1E4, Canada
Telephone: (514) 487-6060

Plan Tel provides consulting services in all aspects of the telephone field to the telecommunications industry, private enterprises, governments and other consultants, working on national and international projects involving overall management consulting, financial and technical planning, engineering, operations and maintenance.

Nationally, the company has contracts with various telephone carriers, government departments and agencies, and large corporations. Internationally, the company acquired its first contract in 1976 in Saudi Arabia. Since then it has completed contracts involving systems design, operations, project management, and management consulting in Antigua, Haiti, Jamaica, Peru, Panama and the US. Working with the Canadian International Development Agency, Plan Tel has been involved in numerous projects in Africa, the Middle East, South East Asia and South America.

Plan Tel was established and incorporated in 1970. It operates with a head office in Montreal, consulting headquarters in Toronto, and branch offices in London, Ottawa, Quebec and Washington.

POLESTAR COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in
the section on EQUIPMENT MANUFACTURERS

◀ Transfer of technology: Technicians from China receive training from MTX instructor.

PROTOCOLES STANDARDS DE COMMUNICATION INC.

1757 Bank Street, Ottawa, ON K1V 7Z4, Canada
Telephone: (613) 731-7697

Protocoles Standards de Communication Inc. (P.S.C.) provides consulting services and training in the field of computer communications and the related international standards. The primary emphasis is on studies and research related to the implementation of international standards for computer communications such as X.25 and OSI, and advanced communication architectures and protocols such as SNA and DECNET. P.S.C. also offers introductory and advanced level training in all aspects of OSI and other computer communication standards.

P.S.C. participates actively in various groups responsible for national and international data processing and telecommunication directions and related standards (principally CCITT and ISO committees).

P.S.C. recently opened a US subsidiary which is currently providing consulting services through Northern Telecom (US) to the regional Bell operating companies to help implement packet switching services.

RYERSON POLYTECHNICAL INSTITUTE

A full description of this firm's capabilities is contained in the section on TRAINING SERVICES.

SASKTEL INTERNATIONAL

2121 Saskatchewan Drive, 3rd Floor, Regina, SK S4P 3Y2, Canada
Telephone: (306) 347-4504

SaskTel International is the international consulting arm of Saskatchewan Telecommunications (SaskTel), a provincial telecommunications carrier. The parent company is a world leader in the development and application of fibre optic technology operating a 3,268 km fibre optic system. Along with its fibre optic expertise, SaskTel has many years of experience with a variety of transmission systems including microwave radio, voice frequency, analog and digital carrier, coaxial cable and satellite.

The company offers consulting assistance in five major areas: technological expertise; planning and supervision of project construction, operation and maintenance; staff training; technical documentation; and computer programs for corporate administration.

SaskTel International has been active in Canada, the US, Chile and the People's Republic of China. Recent major projects include: overall network design of a fibre optic system to connect the major coastal cities from the East to the West coast of the US; craft testing work for the University of Toronto's local area network; and fibre optics communications training and sale of associated practices for the Canadian Department of National Defense.

SPAR AEROSPACE LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SPECTROCAN ENGINEERING INC.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

SYDNEY DEVELOPMENT CORP.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

TELECOMsyst SERVICES INC.

555 Dorchester Boulevard West, Suite 826, Montreal, PQ H2Z 1B1,
Canada, Telephone: (514) 861-0983, Telex: 055-60995

TELECOMsyst Services Inc., established in 1980, provides telecommunications management and technical consulting services. Through its three divisions—equipment/service selection division, technological planning division (office automation) and microwave radio and satellite planning division—the company offers a comprehensive range of services in the selection, design, implementation and turnkey supply of telecommunications systems.

Two major recent projects were a feasibility study to determine the need, cost-effectiveness and benefits for Teleglobe Canada of upgrading its four-location Centrex service to an integrated digital PBX; and the design of Canadian Marconi Company's North American voice and data network, which included integrated voice/data PBX equipment selection, project management, system integration and consultation on office automation issues.

TELECOMsyst also offers executive, management and technical seminars, in-house training services and products/services competitive analyses. The company is the publisher of the "Catalog of Digital PBX Systems", an exhaustive review of the most common systems on the market.

TELECONSULT LTD.

402 West Pender Street, Vancouver, BC V6B 1T6, Canada
Telephone: (604) 684-1144, Telex: 04-532848

Teleconsult Ltd. offers consulting services for needs analysis, marketing, feasibility and advisory studies; system engineering and design; cost estimating, specifications, tender processing and evaluation; construction supervision, project management, acceptance testing; instructional services, maintenance philosophies and planning. The company works in several areas of technology: satellite communications; long and short haul transmission systems (microwave, UHF, VHF, coaxial, and fibre for voice, data, and video); telephony (network design, switching, cable distribution); multiplex (FDM & TDM); broadcasting (AM, FM, television, CATV); supervisory and control systems; cable carrier; telegraphy; vehicular mobile systems; and data transmission systems.

Since its establishment in 1973, Teleconsult has completed a number of projects for domestic and international clients. Among these are a market study for Indonesia Telecommunications, a TDMA country-wide rural telephone system for the Telephone Organization of Thailand, full design and project management of a domestic satellite system for the SADCC countries of Africa (Zambia, Malawi, Botswana, Angola, Swaziland, Lesotho and Mozambique), the design of a microwave system for Pakistan Telegraph and Telephone from Karachi to Peshawar, and conceptual design of a railway communications system for Bangladesh.

TELEGLOBE CANADA

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

TELESAT CANADA

333 River Road, Ottawa, ON K1L 8B9, Canada
Telephone: (613) 746-5920, Telex: 053-4184

Telesat Canada has more than 16 years of experience in the design, implementation and operation of its own domestic satellite communications system. With nine successful launches, representing four generations of satellites, Telesat is in a unique position to offer consulting services in every aspect of implementing a satellite communications infrastructure.

Services offered by Telesat Canada in both the space and earth segments include development consulting, launch mission and satellite control consulting, and earth station consulting.

International consulting services include: evaluation of bids from the international aerospace industry for the space component of the Australian domestic communications system; tracking services for two Australian satellite launches; assistance to the Australian Satellite Co. during the commissioning and service introduction phase of their major city earth station program; evaluation of bids for provision of the spacecraft for a US Direct Broadcast Satellite system, and consultation services during the implementation of the program; provision of technical and management assistance for various European DBS systems; preparation of a domestic satellite feasibility study for the government of South Korea; satellite control training for employees of Brazil's Embratel in preparation for their domestic satellite system; and satellite operations training, mission support and launch director services to Spar Aerospace for two Brazilian satellite launches.

Established in 1969, Telesat operates the world's first domestic, geostationary satellite communications system. It is a private company jointly owned by the government of Canada, Canadian telecommunications common carriers and the public. Since launching its first Anik satellite in 1972, Telesat's satellite facilities have formed an integral part of the Canadian telecommunications infrastructure.

TIW SYSTEMS LTD.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

TSI TELECOMMUNICATION SERVICES INTERNATIONAL

1795 Willingdon Avenue, Burnaby, BC V5C 5J2, Canada
Telephone: (604) 293-3080, Telex: 04-356681, Cable: TELSERV

TSI Telecommunication Services International is the marketing and consulting arm of the BC Tel Group of Companies. Drawing on the support of the provincial telecommunications carrier, British Columbia Telephone Co. (BC Tel), TSI offers services for the planning, design, procurement, construction, operation and management of public and private networks and fully integrated telecommunications systems. TSI will provide turnkey network design or will supply any service to complement client capabilities.

Since it was established in 1983, TSI has worked successfully in many countries in South East Asia and Latin America, and in the People's Republic of China.

TSI is also active in consortium and joint-venture arrangements with Canadian and foreign companies.

WESCOM COMMUNICATIONS STUDIES AND RESEARCH LTD.

853 Richards Street, Vancouver, BC V6B 3B4, Canada
Telephone: (604) 669-7175, Telex: 04-508338

Wescom Communications Studies and Research Ltd. specializes in economic and marketing analysis of the telephone and computer industry. Services include science technology policy and industrial planning; planning and technology assessments of computer and communication technologies and projects; communications and transportation research, socio-economic assessments, economic modeling, evaluation and analyses; and trade support of computer-based technologies for the Pacific countries.

Projects for overseas clients include an evaluation of science and technologies in Malaysia for the World Bank; an assessment of the telecom infrastructure for Malaysia; a study on computer-based learning and industrial training; industrial evaluation in Japan and Tunisia; and economic planning for several Asian governments. The firm has also conducted a wide range of studies for Canadian clients in both the private and government sectors, such as a study of the Canadian software industry, a national evaluation of office automation field trials, an eight-country assessment of high technology policy and plans, a socio-economic assessment of Canada's mobile satellite program, a worldwide evaluation of new information technologies and a market evaluation of cellular radio technologies.

◀
From its Control in Ottawa, Canada, TELESAT performs the precise stationkeeping maneuvers required to maintain geostationary orbit.

WILLIAM G. HUTCHISON & COMPANY

2025 Sheppard Avenue East, Suite 4401, North York, ON M2J 1V7, Canada, Telephone: (416) 498-5344, Telex: 06-966710

William G. Hutchison & Company is an independent firm founded in 1977 which plans, implements and evaluates advanced technologies. Services include strategic planning for governments and industry organizations including market assessments, business plans, industrial strategies, acquisitions and detailed operational plans; policy studies for governments formulating plans or strategies related to communication and information technologies.

The company has completed a number of international projects, primarily in the US, Great Britain, Kenya and Japan. Foremost among these are systems consulting and technology monitoring services (US), technology assessment studies (Japan, US), strategic planning and technology transfer (Great Britain, US), and feasibility studies and management consulting (Kenya).

INTRODUCTION

Telecom Training Services

◀
Headed by some of the most experienced instructional designers in the industry, MICROTEL LEARNING SERVICES is a major developer and supplier of training and educational services.

THE PROVISION OF top quality service to telecommunication users in urban, rural and remote environments relies heavily on the availability of skilled personnel to deliver this level of service. Given the rapid evolution of the technologies involved, training especially designed to meet a variety of technical, planning and management needs is essential. Canada is among the world leaders in this field and has organized the appropriate institutional structures and instructional materials to develop specialized technical and managerial personnel. Canada is an active participant in international programs dedicated to the improvement of telecommunications training, including the ITU's international sharing system for training.

In Canada, training is available from within the telecommunications industry (telephone carriers and equipment manufacturers) as well as from other organizations. In addition, colleges and universities offer a variety of telecommunication courses.

Two of the larger telecommunication training organizations are Bell Canada International Executive Development Centre of Don Mills, Ontario and Microtel Learning Services of Burnaby, British Columbia. The Executive Development Centre is a part of Bell Canada Enterprises, while the Microtel Learning Services is a part of the British Columbia Telephone group. Bell Canada and British Columbia Telephone are not only the two largest telecommunication carriers in the country but are also associated with the two largest equipment manufacturers. As a result, their training operations have access to a vast array of expertise. This combination of research and development, manufacturing and operation experience offers a unique broad base of expertise.

Other private firms also offer special courses tailored to specific client requirements. For example, the Institut international de communication, located in Montreal, Quebec, is well-known in French-speaking countries, including within the Agence de cooperation culturelle et technique (ACCT). CEGIR Inc., also of Montreal, organizes courses in English or French for telecommunication and broadcasting students.

Many firms are able to offer courses in languages other than English or French to suit the requirements of overseas clients. In certain cases, training courses can be arranged at the client's own premises, and delivered by Canadian trainers and lecturers.

Programs available from Canadian colleges and universities are also listed in this section. The "Directory of College and University Programs" which is published annually by the Canadian Department of Employment and Immigration contains additional information. The Directory is available for consultation at Canadian Embassies, High Commissions and Consulates around the world.

2001 S.N.I. (SATELLITE NETWORK INC.)

A full description of this firm's capabilities is contained in
the section on EQUIPMENT MANUFACTURERS.

AEA ELECTRONIC LTD.

A full description of this firm's capabilities is contained in
the section on EQUIPMENT MANUFACTURERS.

ALTA TELECOM INTERNATIONAL LTD. (ATI)

A full description of this firm's capabilities is contained in
the section on CONSULTING SERVICES.

ANGUS TELEMANAGEMENT GROUP INC. (ATMG)

A full description of this firm's capabilities is contained in
the section on CONSULTING SERVICES.

ASSOCIATION OF UNIVERSITIES AND COLLEGES OF CANADA

151 Slater Street, Ottawa, ON K1P 5N1, Canada
Telephone: (613) 563-1236, Telex: 053-3329, Cable: CANUF OTTAWA

The Association of Universities and Colleges of Canada coordinates national initiatives undertaken by its member institutions and maintains a variety of centrally administered services. It represents the concerns of the university community to the government of Canada, to the Council of Ministers of Education, Canada, to the general public and to national and international fora. It provides a forum for the study and discussion of issues in higher education and facilitates the exchange of ideas and information among its members. It also acts as a national clearing house for information on higher education in Canada.

AUDOR COMMUNICATIONS INC.

A full description of this firm's capabilities is contained in
the section on EQUIPMENT MANUFACTURERS.

BELL CANADA INTERNATIONAL INC.

A full description of this firm's capabilities is contained in
the section on CONSULTING SERVICES.

BELL CANADA INTERNATIONAL EXECUTIVE DEVELOPMENT CENTRE

86 Overlea Boulevard, Toronto, ON M4H 1C6, Canada
Telephone: (416) 425-4130, Telex: 06-218812

The Bell Canada International Executive Development Centre was established in 1982 to train executives, functional managers and technical personnel from telecommunications organizations around the world. Such training has been provided to students from Saudi Arabia, Iraq, Nigeria, Trinidad and Tobago, Brazil and Singapore.

In addition, the Centre has conducted seminars, tours and lectures in telecommunications technology and management for executives and technicians from 30 other countries.

The Centre's program features internationally experienced consultants with direct access to a training group responsible for the development of a staff of more than 40,000 employees; an assessment process to ascertain specific client requirements; a curriculum that can be tailored to meet any organizational needs; experienced course leaders selected from Bell Canada to provide "hands-on" training; visits to relevant Bell Canada operations and follow-up discussions to provide on-the-job exposure; provision of documentation and source materials for future reference, and certificates indicating successful course completion.

BMS COMMUNICATIONS SERVICES LTD.

A full description of this firm's capabilities is contained in
the section on TURNKEY SYSTEMS.

CABLESHARE INC.

A full description of this firm's capabilities is contained in
the section on INFORMATION SYSTEMS.

CANAC TELECOM

A full description of this firm's capabilities is contained in
the section on TURNKEY SYSTEMS.

CEGIR

2 Complexe Desjardins, Bureau 2301, Montreal, PQ H5B 1B3, Canada
Telephone: (514) 288-6942, Telex: 055-60249

CEGIR specializes in the transfer of technology through consultation, technical assistance, project management and training. From its offices in Canada, Abidjan, Dakar, Geneva, Manila and the US, the firm manages projects and provides expertise to clients in 25 countries.

CEGIR's expertise focuses on five major sectors: data processing, office automation and ergonomics; education and vocational training; technical assistance and industrial development; water resources and rural development; and communications. The company's goal is to help its clients become fully autonomous through training of local executives and professionals, who will in turn take over the future development of the projects.

Established in 1970, CEGIR's education and vocational training services include the planning and organization of training programs, educational technology, technical and vocational training and school construction and project management.

Other recent communications projects include: the establishment of management services for the West African section of Panaftel (Panafrican Telecommunications Network), which included the recommendation of tariff structures for telephone services; a technical assistance study undertaken for l'Office National des Telecommunications (ONATEL) in the Republic of Burundi; design of a tarification structure of telecommunications services for the Ministry of Post and Telecommunications for the Republic of Rwanda; and the development and implementation of general and analytical accounting systems, budget planning and management control systems for the Department of Post and Telecommunications for Senegal.

DATACAP LTD.

A full description of this firm's capabilities is contained in
the section on INFORMATION SYSTEMS.

DATAGRAM INC.

A full description of this firm's capabilities is contained in
the section on EQUIPMENT MANUFACTURERS.

DOUSERV GROUP INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

ELINCA COMMUNICATIONS LTD.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

ForceTen ENTERPRISES INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

GENESYS GROUP INC.

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

GNB BATTERIES (CANADA) INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

HUMBER COLLEGE OF APPLIED ARTS AND TECHNOLOGY

205 Humber College Boulevard, Rexdale, ON M9W 5L7, Canada
Telephone: (416) 675-3111

Through its Business Division, Toronto's Humber College offers a unique Distance Learning Program in Telecommunications Management. The program, which provides comprehensive training in all key aspects of telecommunications management, is aimed specifically at people currently working in telecommunications who want to gain new skills, or upgrade existing ones. The program consists of printed coursework, an album of audio lectures, and assignments, case studies and prescribed tests. Telephone dialogue with tutors can also be arranged.

The Distance Learning Telecommunications Management program, which is the first of its kind in Canada, was developed by joint industry, consultant and college cooperation, and is monitored by a highly experienced and strong industry advisory committee.

IDON CORPORATION

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

INFOMART

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

INFORMATICS EDUCATION LTD.

329 Lakeshore Road East, #205, Oakville, ON L6J 1J4, Canada
Telephone: (416) 844-2880

Informatics Education Ltd. offers intensive short-term telecommunications training courses in data communications, network design, office systems, telecommunications management, local area networks and choosing and implementing telephone systems. Courses range from basic to advanced, and usually run from one to five days.

The company, which was established in 1973, operates out of four locations, three in Canada and one in London, UK. Courses are offered both at the company's training facilities, or on-site, in conjunction with local organizations.

▼

A BELL CANADA INTERNATIONAL consultant coaches a staff member of the Trinidad and Tobago Telephone Company which BCI has been assisting in a major expansion and moderization project since 1982.

INSTITUT INTERNATIONAL DE LA COMMUNICATION

451 rue St. Jean, Montreal, PQ H2Y 2R5, Canada
Telephone: (514) 842-8787, Telex: 05-27321

The Institut international de la communication (IIC) was founded in 1975 as a center for training in communication and new technologies. Its Research and Development department develops methods, courses and software; its International Cooperation department is dedicated to international project management, institutional agreements and student development; and its Training department specializes in training in communication techniques and new technologies as well as in communication in foreign languages and in educating trainers.

IIC holds specialized training sessions for foreign trainees throughout the world and in Canada in collaboration with local institutions. Training sessions can be organized on any theme and targetted to the needs of a specific group.

In consulting and international project management, ICC manages a program for the Canadian International Development Agency in French-speaking African countries. The Institut is also active in Gabon, and regularly brings educational and technical support to foreign institutions such as the School of Journalism at University of Dakar in Senegal and the University of Yaounde in Cameroun.

▲
An international seminar at the INSTITUT INTERNATIONAL DE LA COMMUNICATION.

INTERCONTINENTAL DATA CONTROL CORP. LTD. (INTERDACO)

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

MICROTEL LIMITED

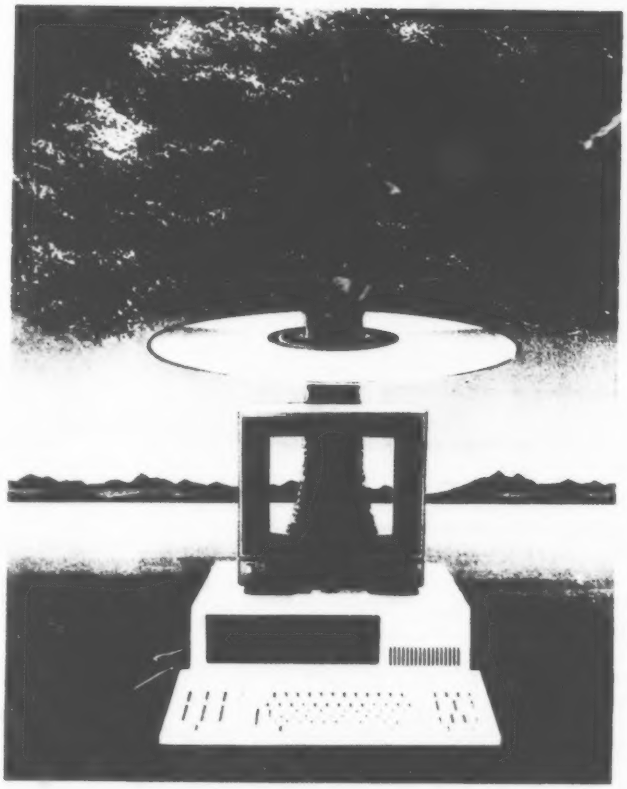
A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS

MICROTEL LEARNING SERVICES

1795 Willingdon Avenue, Burnaby, BC V5C 5J2, Canada
Telephone: (604) 293-3653, Telex: 04-354820

Microtel Learning Services (MLS) has been involved in telecommunications technology training for over 30 years. MLS offers over 300 training programs, ranging from telecommunications technology to personal productivity and management skills development, conducted either at customer location or at one of the company's education centres in North America. Computer-based training is offered on a variety of systems, including Hazeltine's TICCIT, the WICAT system and IBM PCs. In addition, MLS has design and development teams which develop state-of-the-art training programs, and also offers a computer-assisted bilingual (English/French) technical documentation service.

Microtel Learning Services is a wholly-owned division of Microtel Limited, a major Canadian telecommunications manufacturer. The division evolved from Teletraining, an organization serving the training needs of Microtel and GTE, when MLS began to market its training programs worldwide in 1984. International clients include ARAMCO Saudi Arabia, Indonesia Perumtel, Kenya Postal Telecommunication, British Telecom and GTE International (Latin America, Far East, Australia, Hong Kong, Puerto Rico and Manila).



MTX TELECOM SERVICES INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

PROTOCOLES STANDARDS DE COMMUNICATION INC.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

RYERSON POLYTECHNICAL INSTITUTE

350 Victoria Street, Toronto, On M5B 2K3, Canada
Telephone: (416) 979-5026, Telex: 065-28056

Ryerson Polytechnical Institute is a leader in the provision of professionally relevant education. In 1980 the Institute established the Ryerson International Development Centre (RIDC), with the goal of furthering the advancement of the developing world in technological and educational spheres. To date, the Centre has focussed on the development or upgrading of educational institutions and programs, training systems, and technical facilities, with many projects involving the establishment of direct links with educational and other public sector institutions in developing countries.

RIDC's principal activities are: Education Planning, both at Ryerson and overseas; Institutional Development, consultancy on development of educational institutions; Feasibility Studies; Specialized Training; Applied Research; Technical Consultancies; and Information Services.

RIDC offers expert assistance and consultation relative to the educational, training and applied research needs of developing countries. International projects include a telecommunications training feasibility study in Jordan, broadcast production training in the Asia-Pacific Region, Commonwealth Africa, Jamaica, Malaysia and Bahamas, and interdisciplinary research on the Impact of Advanced Technology and Communications Systems on the developing world.

SASKTEL INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

SHERIDAN COLLEGE

1430 Trafalgar Road, Oakville, ON L6H 2L1, Canada
Telephone: (416) 845-9430

Through its School of Computer Studies, Sheridan College offers an in-depth post-graduate course in telecommunications management. The one-year program covers all aspects of telecom studies, ranging from technical to management concerns, and is the only full-time telecom management course currently offered by a Canadian academic institution. The course material is also packaged in audio, visual and text format, and available for sale (in English only). These "Distance Learning Packages", which are also used by other Canadian colleges and universities for part-time courses, are a result of cooperation between Sheridan College, Humber College (see separate listing) and the Ontario Ministry of Education.

Although offered at Sheridan College, the telecommunications management course is strongly supported by major Canadian telecommunications companies and overseen by a board of management comprised of representatives from these firms. The majority of course instructors are independent telecommunications consultants drawn from across Canada.

SPAR AEROSPACE LIMITED

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

SPECTROCAN ENGINEERING INC.

A full description of this firm's capabilities is contained in the section on TURNKEY SYSTEMS.

SR TELECOM INC.

A full description of this firm's capabilities is contained in the section on EQUIPMENT MANUFACTURERS.

TELECONSULT LTD.

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

TELEGLOBE CANADA

A full description of this firm's capabilities is contained in the section on INFORMATION SYSTEMS.

TELESAT CANADA

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

TSI TELECOMMUNICATION SERVICES INTERNATIONAL

A full description of this firm's capabilities is contained in the section on CONSULTING SERVICES.

Alphabetical List of Companies

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